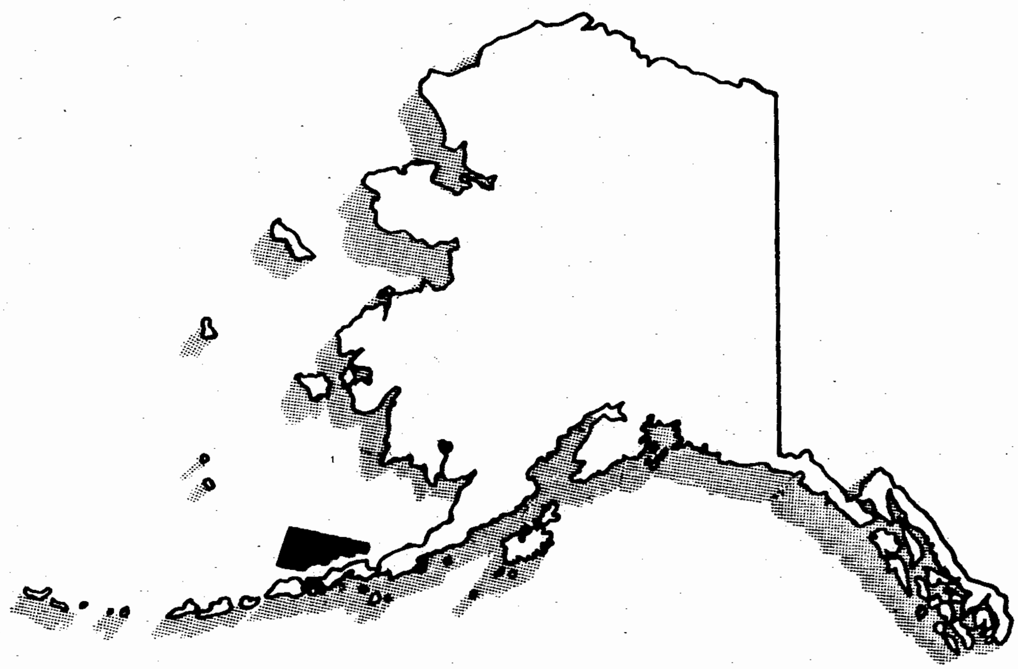
OCS EIS/EA
MMS 85-0052

Final Environmental Impact Statement
NORTH ALEUTIAN BASIN SALE 92
Volume 2



U.S. Department of the Interior
Minerals Management Service
Alaska Outer Continental Shelf Region

This Environmental Impact Statement (EIS) is not intended, nor should it be used, as a local planning document by potentially affected communities. The facility locations and transportation scenarios described in this EIS represent assumptions that were made as a basis for identifying characteristic activities and any resulting environmental effects. 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, and applicable state and local laws and regulations.

United States
Department of the Interior

Final
Environmental Impact Statement

Volume 2

September 1985

Proposed
North Aleutian Basin
Lease Sale
(Sale 92)

Prepared by
Minerals Management Service
Alaska OCS Region

V.

REVIEW AND ANALYSIS OF COMMENTS RECEIVED

V. REVIEW AND ANALYSIS OF COMMENTS RECEIVED

The North Aleutian Basin EIS team reviewed 35 letters and the transcripts of testimony from public hearings held during the DEIS comment period in Dillingham, Naknek, and Anchorage, Alaska (the public hearing scheduled for Sand Point was cancelled because of bad weather). Letters were received from fifteen federal agencies, two state agencies, one Alaska State Representative, four regional or local governments, two environmental groups, one fishermen's organization, seven oil and gas firms, and three individuals.

The EIS team responded to all (approximately 880) comments from the letters and the hearings testimony. Where comments warranted changes in the text of the EIS or presented new, substantive information, the EIS was revised accordingly (pertinent sections are cited in the responses to specific comments).

The major concerns/issues of those commenting on the DEIS include: (1) adequacy of information; (2) mitigating measures; (3) deferral alternatives; (4) oil-spill-cleanup technology; (5) development scenarios; (6) oil-spill-risk analysis; (7) effects analysis of biological resources, particularly fisheries resources; (8) effects analysis of the commercial fishing industry; and (9) assessment of the effects of the leasing proposal on the affected communities.

The following substantial changes were made in the text:

- A section describing the litigation history for the North Aleutian Basin lease sale area is included in Section I.C.

- In addition to the pipeline-transportation scenario analyzed for Alternative I, an offshore-loading-transportation scenario is included in the FEIS as a transportation option for this alternative. This scenario is analyzed in Section IV.B.2.

- An Information to Lessees on Oil-Spill Contingency Plans was added to Section II.C.1.b.

- Additional information is provided on the fate and behavior of spilled oil (Sec. IV.A.3.d.) and oil-spill response (Sec. IV.A.4. and Appendix M).

- A general discussion on the effects of oil on the ecosystem, and a reanalysis of effects on fisheries resources, were incorporated in Section IV.B.1.a.

- A worst-case analysis for a 100,000-barrel oil spill was added to Section IV.J.

- The resource estimates for Alternative IV have been changed from those included in the draft EIS. The estimates have been changed from 364 to 331 MMbbls of oil for Alternative IV. The assumption regarding distribution of oil resources in the Oil Spill Risk Model was changed to accommodate comments on the DEIS and resolve inconsistencies with other document assumptions.

This section contains excerpts of substantive oral testimony given during the three public hearings, reproductions of all letters received in comment on the DEIS, and responses prepared by the MMS.

Public Hearing Comments and Responses

Public hearings were held during the DEIS comment period at the following places and dates: Dillingham, Alaska (February 19, 1985); Naknek, Alaska (February 20, 1985); Anchorage, Alaska (February 26, 1985). A public hearing scheduled for February 21 at Sand Point was cancelled because of bad weather. Speakers at the public hearings are listed in this section in the order of their appearance. Because of the volume, transcripts of oral testimony are not reproduced here; instead, significant issues discussed by the speakers have been excerpted and presented in this section.

Speakers who presented written documentation of their oral testimony are indicated with an asterisk (*). Where letter comments reiterated oral testimony, the reader is referred to Letter Comments and Responses.

DILLINGHAM PUBLIC HEARING:

1. Mr. John Shively (State of Alaska)*
   State of Alaska comments are addressed in Response 1.

2. Mr. Tim Hostetler (Bristol Bay Coastal Resource Service Area [BBCRSA])
   BBCRSA comments are addressed in Response 30.

3. Mr. Joseph Clark (BBCRSA)
   BBCRSA comments are addressed in Response 30.

4. Mr. Hjalmer Olson
   No response required.

5. Mr. Joe McGill (Alaska Herring Co-op)
   No response required.

6. Ms. Dorothy Flensburg*
   No response required.

7. Mr. Harold Samuelsen, Jr.
   No response required.

8. Mr. Val Angasan
   No response required.

9. Mr. Charles Mayer (Bristol Bay Herring Marketing Co-op)
   No response required.

10. Mr. Harvey Samuelson (Western Alaska Marketing Association)
    No response required.

NAKNEK PUBLIC HEARING:

No speakers testified at this public hearing.

ANCHORAGE PUBLIC HEARING:

1. Mr. Lonnie Brooks (National Ocean Industries Association [NOIA])*

Comment Anchorage 1

NOIA believes that the schedules for exploration and development that appear in the DEIS are overly optimistic by about 3 years. This overly optimistic development schedule has two distinct disadvantages. First, it incorrectly projects potential impacts sooner than they might actually occur. Second, the schedule appears to decrease the amount of time available for planning and assessment. Those interested in this sale should recognize that exploration and development of oil and gas in Bristol Bay will take a very long time. While the time estimates of individual companies may differ, it is generally agreed that it will take about thirteen years from the time of the lease sale until first production. The elements which contribute to this long exploration-to-production timeframe include: the geologic complexity of the area, the severity of environmental conditions, and the sequential procedures for acquiring geophysical data, drilling, testing, and analyzing each well. The extremely high cost of development is perhaps the single most important factor in determining the schedule of activities. Because of this high cost, it will take considerable time to discover, delineate, and characterize reserves that are large enough to justify these enormous capital investments.

Response Anchorage 1

This concern is addressed in Response 8-23.

2. Ms. Cindy Lowry (Greenpeace, USA)*

Comment Anchorage 2

Let me begin by saying we are encouraged that the original size of the sale has been reduced by 83 percent. However, we feel that this does not go far enough to protect one of the most unique marine ecosystems in the world, namely Bristol Bay. The area that is now up for lease is the most biologically sensitive in Bristol Bay with respect to the many species of marine mammals, fish, and seabirds that inhabit its waters. Included in this sale is Unimak Pass, which is the critical migratory pathway for over 10,000 endangered gray whales (two-thirds of the world population), other endangered populations of sperm, fin, and humpback whales, 1.2 million northern fur seals, and millions of seabirds. In addition, critical habitat areas are left open for exploitation, such as Izembek and Nelson Lagoons, which provide feeding areas for gray whales and migratory bird populations as well as haulout areas for other marine mammals. It should also be noted that Bristol Bay encompasses the world's largest salmon fishery; and not only are fish and wildlife populations at risk under this plan, but humans, as well, who depend on these biological resources for their very existence.

Response Anchorage 2

As indicated in Figure II-1, Unimak Pass and Izembek and Nelson Lagoons are not included in the North Aleutian Basin (Sale 92) lease sale area.

3. Mr. Chuck Becker (Alaska Support Industry Alliance)*
No response required.

4. Ms. Barbara Johnson (National Audubon Society)*
No response required.

5. Mr. Peter Hanley (Sohio Alaska Petroleum Company)*
Sohio Alaska Petroleum Company comments are addressed in Response 9.

6. Mr. Carl Bauman (AOGA)*

Comment Anchorage 6a

No compelling reason has been advanced to delete the 137 whole or partial blocks within 40 kilometers of the Alaska Peninsula from this lease sale, as is analyzed in Alternative IV.

Response Anchorage 6a

Alternative IV was developed at the request of the U.S. Fish and Wildlife Service, the Aleutians East CRSA Board, and the Bristol Bay CRSA Board. The NMFS biological opinion recommended deferral of all blocks within 40 kilometers of the Alaska Peninsula as a reasonable and prudent alternative, to avoid likely jeopardy to migrating endangered gray whales.

Comment Anchorage 6b

We feel it is pertinent to note, because the DEIS does not do so in any specific reference, that it was 1974 when the area was first proposed for leasing--with the lease sale to have taken place in 1977. Since then, the sale area has been stricken from the leasing schedule, re-instated in a drastically reduced configuration, delayed twice more, and further reduced in size.

Response Anchorage 6b

Section I.B. (Leasing History) of the EIS has been updated to reference all prior proposed leasing activities.

7. Mr. Wayne Smith (AOGA)*

Comment Anchorage 7

The DEIS assumes two development and transportation scenarios (page II-B-1). One would consist of laying a pipeline from offshore platforms through Point Moller and Herendeen Bay with a tanker terminal at Balboa

Bay. The second scenario would involve transferring oil from offshore platforms via shuttle tankers to a transshipment terminal at Balboa Bay. It should be realized that these are only two possible transportation scenarios. A more probable scenario would be the use of single-point offshore-loading facilities, where the oil would be loaded directly into the tankers that would take it to market. This would have much less environmental impact on the area. Offshore-tanker loading is proven technology and is currently used in the North Sea.

Response Anchorage 7

The EIS has been amended to include an analysis of an offshore-loading scenario under Alternative I (Sec. IV.B.2. of the FEIS).

8. Mr. William Gusey (AOGA)*
No response required.

9. Mr. J. D. Bertino (Chevron USA, Inc.)*
No response required.

10. Mr. Cliff Eames (Alaska Center for the Environment)

Comment Anchorage 10

I'd like to make just one other point on the specifics of the DEIS, and that is, the failure to provide for effective stipulations to protect wildlife populations, either for specific resources or for seasonal closures. We'd like to see both types of stipulations included in the final sale.

Response Anchorage 10

The mitigating measures proposed in the EIS are designed to be practical, realistic, and enforceable, taking into consideration the potential effects and the existing laws, regulations, and orders that provide mitigation. At this stage in the process (leasing), site-specific exploration and development strategies are only hypothesized. Therefore, the EIS can realistically consider mitigation only on a broad or general scale. There will be opportunities at a later time for identifying specific wildlife populations that may need special protection. Mitigating measures could be imposed upon approval of exploration plans, development and production plans, and right-of-way (pipeline) applications. Submission of these plans by the oil industry would better identify specific locations where and time periods when mitigation would be purposeful.

11. Mr. Henry Mitchell (United Fishermen of Alaska)*
The United Fishermen of Alaska comments are addressed in Response 6.

12. Ms. Abby Arnold (Aleutians East CRSA)*
The Aleutians East CRSA comments are addressed in Response 4.

13. Mr. Jack Hession (Sierra Club)*
The Sierra Club comments are addressed in Response 34.

Letter Comments and Responses

All letters received during the DEIS comment period are reproduced in this section. Letters received from the Cities of Alegnagik, Port Heiden, and Togiak, and from the Villages of Egegik, Pedro Bay, and Portage Creek are reproduced as enclosures to Letter No. 1. Bracketed and numbered comments are followed by respectively numbered responses prepared by the MMS.

A list of commentors follows.

* No response required.

1 STATE OF ALASKA

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March 12, 1985

Mr. Alan Powers
Alaska OCS Region
Minerals Management Service
P.O. Box 101159
Anchorage, AK 99510

Dear Mr. Powers:

The State of Alaska has reviewed the draft Environmental Impact Statement (EIS) for the North Aleutian Basin (NAB) oil and gas lease sale 92. Oil and gas exploration and development in this area currently presents too great a risk to the State and National interest in maintaining the extremely productive and valuable fish and wildlife resources which characterize this region. Prior to pursuing leasing in Bristol Bay, industry should be encouraged to obtain additional experience in less productive and sensitive areas to ensure that adequate technology exists to operate safely in this extremely valuable and sensitive region. Effective open-ocean oil spill cleanup countermeasures must also be developed to assure that important habitats and fish and wildlife populations can be adequately protected in the event of a major oil spill. Additionally, significant biological data gaps must be filled before a responsible impact assessment can be performed, which is a prerequisite for the decision making process for Sale 92.

The State's comments on the draft EIS are organized into four sections including: 1) the proposed action and alternatives, 2) the proposed mitigating measures, 3) the description of the affected environment, and 4) the environmental consequences of the proposal. Each of these topics are briefly discussed below with more detailed comments and supporting information contained in Enclosures 1 through 6. Page specific comments on the NAB draft EIS are included in Enclosure 7. A substantial number of review comments were received by this office during the State's public review of the draft EIS which are included in Enclosure 8. The State would appreciate the Department of Interior (DOI) responding to both our general comments and those contained in the Enclosures when preparing the final EIS.

Proposed Action and Alternatives

As noted in Governor Sheffield's January 10, 1984, letter to the Secretary of Interior and more recently in the State's testimony at the DOI's February 19, 1985, public hearing in Dillingham, the State does not concur with the proposed action (Alternative 1) presented in the draft EIS. Instead, we propose that Alternative 3 be revised to defer the lease sale until at least 1994.

As we have stated before, there are a number of compelling reasons why delaying the sale is in the best interest of both the State and the Nation. First, unparalleled fish and wildlife resources could be at risk from oil and gas development activities. The NAB is located in the midst of one of the richest fishing grounds in the world and the greatest concentration of birds, fish and marine mammals on the North American Continent. It is important to note that the domestic Bristol Bay fisheries have a first wholesale value of 250,000,000 dollars and employs over 10,000 people annually. Second, delay of the sale would allow additional time to conduct environmental research necessary to fill the significant environmental assessment data gaps identified by the State (enclosure 1). Third, industry would have an opportunity to obtain operating experience in other less sensitive and biologically productive areas of the Bering Sea prior to initiating operations in Bristol Bay. Fourth, this approach would provide additional time to improve oil spill containment and cleanup capabilities under the open-ocean conditions prevalent in the proposed sale area. Finally, this approach is consistent with the State's policy to defer leasing in the nearshore waters within the three-mile limit until at least 1994.

Proposed Mitigating Measures

1-1a In addition to the above recommendation for delaying the sale until at least 1994, the State recommends that several revisions be made to the proposed mitigating measures. As proposed, the mitigation measures contained in the draft EIS are insufficient and provide a minimal level of protection to fish and wildlife resources, habitats and harvest activities from the type and magnitude of impacts and risks associated with oil and gas exploration and development in the NAB. The State's recommendations for revisions to the lease sale stipulations and Information to Lessees are fully described in Enclosure 2. We would emphasize that the State strongly opposes leasing in the NAB as currently scheduled and our recommendations for mitigation measures should not be interpreted as lending support to the proposed action in the draft EIS.

1-1b The State is compelled to take issue with the DOI's consistent use of oil spill cleanup measures as a mitigating factor to environmental risks from oil spills (e.g., pages XVIV, II-C-13, IV-G-I, etc.). The draft EIS implies that the capability exists to effectively clean up oil under open-ocean conditions in the NAB. The State questions these implications and has repeatedly requested that the draft EIS include an evaluation of the potential effectiveness of oil spill response and cleanup operations in the NAB. The DOI has refused to accommodate the State's request on the grounds that a reasonable and conservative approach for assessing environmental effects is to assume no cleanup response. However, oil spill countermeasures are repeatedly addressed as mitigating factors in the draft EIS. This approach is inconsistent with DOI's stated assumption and is likely to mislead both the public and federal decision makers, who may get the mistaken impression that oil spill countermeasures eliminate "worst case" impacts. We believe the draft EIS is seriously flawed by its failure to provide the basis for concluding that effective oil spill response measures can be conducted in the NAB.

Description of the Affected Environment

1-1c While the draft EIS provides much useful information on the environmental and social features of the NAB, there are several notable deficiencies pertinent to evaluating the lease sale proposal. First, at least portions of the resource assessment appear to be based on the original sale area planning boundaries, rather than the current proposed Sale 92 area. Portions of the assessment are therefore confusing and inaccurate. Second, there is pertinent information on several fish and wildlife species that should be included in the draft EIS, but was not. Therefore, the assessment does not appear to contain current and up-to-date information. Third, the resource assessment fails to acknowledge the limitations of available information. As a result the reviewer is unable to interpret the adequacy of environmental information to ensure a high level of confidence in the impact assessment. Examples of these deficiencies are contained in Enclosure 3. In addition, the draft EIS resource assessment covers an extremely large region and does not adequately focus on areas of primary biological concern. To facilitate the DOI's consideration of three areas which the State believes are of extremely high biological productivity and sensitivity, we have prepared a resource overview of these areas in Enclosure 4. It would be beneficial to reviewers if the DOI included similar overviews in their final EIS.

Environmental Consequences of the Proposal

1-1d As a result of the State's Information Needs Analysis for the NAB (Enclosure 1), a number of significant data gaps have been identified which make us seriously question the adequacy of the assessment of environmental impacts and effectiveness of mitigating measures contained in the draft EIS for Sale 92. The

DOI should delay Sale 92 until the necessary studies have been conducted and this information is available.

1-1e The State is also concerned that DOI's analysis of potential environmental impacts has downplayed development risks by relying on DOI's own relative index of impact assessment, exploration and development scenarios, and prediction of oil spills. The DOI impact index is particularly unsettling because significant impacts on local fish and wildlife populations are minimized by comparing effects on a region-wide basis. This invariably allows the DOI to conclude that although activities may have serious consequences in localized areas, regional populations will be altered very little and that the over-all impact is "moderate" or "minor."

1-1f Conservative estimates on the level of oil and gas exploration and development activities also act to minimize anticipated environmental impacts. We question whether the DOI's predicted level of seismic exploration, exploration and delineation drilling, and production and service wells are realistic.

1-1g Additionally, the draft EIS oil spill predictions may downplay development risks. The spill probabilities used by the draft EIS should be considered conservative because they are based on a synthesis of information gathered from the Outer Continental Shelf (OCS) areas which may exhibit less severe environmental hazards. Furthermore, the spill probabilities do not take into account the potential use of tankers in the NAB; utilize mean, rather than maximum, oil production estimates; and do not provide additional risk estimates for areas traversed by projected pipelines. All of these factors may contribute to a lower calculated spill probability.

1-1h The oilspill impact assessments for open water areas, while needing some clarification, are reasonable estimates of biological impacts due to soluble hydrocarbon fractions. The conclusions, however, may be questioned for nearshore and shoreline areas. The relative terms used to describe impacts, such as "major", "moderate" and "minor", are acknowledged to be subjective and agrueably, some impacts could be termed "catastrophic" depending on the species and geographic extent of impact.

A detailed discussion of the aforementioned impact analysis concerns, including relevant examples and a critique on the potential spill impacts in the Port Moller Resource Area, is presented in Enclosure 5.

1-1i Finally, we have noted substantial deficiencies in the draft EIS impact analysis concerning potential adverse effects on the commercial fishing industry. The impact analysis should more accurately address the following potential problems: 1) gear conflicts with seismic operations, 2) trawl gear damage from oil development related obstructions and debris; 3) infrastructure and service-support conflicts; and 4) competition for labor. Because of the economic and social importance of commercial fishing in the Sale 92 vicinity, detailed comments on this portion of the draft EIS impact assessment have been prepared. These comments are presented in Enclosure 6.

Conclusion

To summarize, the State continues to strongly oppose oil and gas leasing in the NAB until at least 1994. In the event that DOI continues to pursue leasing despite the State's objections, the Information to Lessees should contain a clear statement that the State opposes leasing until at least 1994 for the reasons discussed in these comments and that the State will continue to maintain its opposition regardless of whether the area is leased.

Sincerely,

Robert L. Grogan
Associate Director

Enclosure

cc w/enc: Commissioner Wunnicke, DNR, Juneau
Commissioner Collinsworth, DFG, Juneau
Commissioner Ross, DEC, Juneau
Commissioner Notti, DCRA, Juneau
Attorney General Gorsuch, Juneau
John Katz, Washington D.C. Office
Tim Hostetler, Bristol Bay CRSA, Dillingham
Abby Arnold, Aleutians E. CRSA, Anchorage
Cass Parsons, United Fishermen of Alaska, Juneau
Henry Mitchell, Bering Sea Fishermen's Assoc., Juneau
William Hopkins, AOGA, Anchorage
H.C. Heinze, ARCO Alaska, Inc., Anchorage
R.H. Weaver, Exxon Company, U.S.A., Anchorage
G.N. Nelson, Sohio Alaska Petroleum Company, Anchorage
B.E. Bernard, Shell Oil Company, Anchorage
J.L. Weaver, Chevron, U.S.A., Inc., Anchorage
P.L. Hellman, Mobil, Denver
T.L. Hazen, Texaco, Los Angeles
C.A. Dowden, Marathon, Anchorage
R.I. Sweatnam, Phillips Petroleum, Anchorage
Lisa Spear, NRDC, New York

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ENCLOSURE 1

SIGNIFICANT INFORMATION NEEDS PERTINENT TO THE IMPACT ASSESSMENT OF PROPOSED OCS SALE 92 (NORTH ALEUTIAN BASIN)

February 1985

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SUMMARY OF INFORMATION NEEDS PERTINENT TO THE IMPACT ASSESSMENT OF PROPOSED OCS SALE 92

1. FISHERIES

a. King Crab

1.) Potential impacts of oil and gas development activities on developing king crab eggs, including:

- potential for direct hydrocarbon uptake by king crab eggs.
- onshore-offshore migratory behavior of egg-bearing female king crab.
- potential for hydrocarbon contaminants to inhibit chemoreception capabilities of male king crab in locating females for successful copulation.

2.) Potential impacts of oil and gas development activities on king crab larvae and juvenile recruitment in Bristol Bay, including:

- long-term studies on the nearshore distribution of king crab larvae in Bristol Bay.
- importance of protective rearing habitat to the survival of first and second-year juvenile king crab.

3.) Potential impacts of oiled sediment on settling and recruitment of food organisms important to juvenile king crab.

b. Pacific Salmon

1.) Potential impacts of oil and gas development activities on seaward migrating juvenile salmon along the North Aleutian Shelf, including:

- documentation of seaward migration patterns and timing of Pacific salmon through Bristol Bay.
- ability of juvenile salmon to detect and avoid hydrocarbon contaminated waters.

2.) Ability of adult salmon to migrate through oil contaminated waters.[1]

3.) Potential effects of seismic operations on the commercial salmon fishery.[1]

c. Herring

1.) Potential impacts of oil and gas activities on juvenile and adult herring, including:

- distribution and abundance of spawning herring.
- distribution of herring larvae.
- distribution and abundance of herring outside of the spawning season.
- migration pathways of juvenile and adult herring.

1/ Information needs currently being addressed by Outer Continental Shelf Environmental Assessment Program (OCSEAP) studies.

2.) Potential impacts of oil pollution on herring spawning substrates (Fucus, Zostera), including:

- effects on the productivity of marine plants.
- possible mortality of plants due to oil contamination.
- effects on possible recolonization of previously oiled areas.

d. Capelin

1.) Potential impacts of oil and gas development activities on juvenile and adult capelin, including:

- distribution and abundance of adult capelin.
- delineation of nearshore capelin spawning areas.
- distribution and migration patterns of larval and juvenile capelin.

2.) Potential impacts of oil pollution on capelin spawning substrates (sand and gravel).

- vulnerability of capelin spawning beaches.
- incorporation of pollutants into beach substrates.
- persistence of contaminants in substrates.

3.) Toxic effects of oil contamination on capelin adults, juveniles, larvae, and developing eggs.

e. Pacific Sand Lance

1.) Potential impacts of oil and gas development activities on all life stages of sand lance, including:

- distribution and abundance of adult, juvenile, and larval sand lance.
- delineation of sand lance spawning areas.

2.) Potential impacts of oil pollution on sand lance spawning substrates (sand and gravel), including:

- vulnerability of sand lance spawning beaches.
- incorporation of pollutants into beach substrates.
- persistence of contaminants in substrates.

3. Toxic effects of oil contamination on sand lance adults, juveniles, larvae, and developing eggs.

2. BIRDS

1.) Potential impacts of oil and gas related disturbance on staging waterfowl, including:

- short and long-term biological effects of disturbance to staging waterfowl populations, particularly black brant and emperor geese.
- buffer zones (altitude or distance restrictions) necessary to adequately minimize aircraft disturbance and other noise and movement sources to staging and molting waterfowl.

2.) Winter distribution and abundance of seabirds in the North Aleutian Shelf area.

3. MARINE MAMMALS

1.) Potential impacts of oil and gas activities on the eastern Pacific gray whale population, including:

- effects of oil contamination on gray whales.
- importance of the North Aleutian Shelf as a "migratory" feeding area.
- effects of seismic operations and other industrial noise sources on gray whale feeding behavior.[1/]

2.) Migratory behavior of sea otters along the North Aleutian Shelf including the importance and use of False Pass as a migration corridor.

4. HABITATS

1.) Effects of oil pollution on eelgrass beds along the northern shoreline of the Alaska Peninsula.

5. OIL SPILL CLEANUP ANALYSIS

1.) Analysis of oil spill response capabilities to assess the potential for successful open-ocean spill response actions in the North Aleutian Basin.

SIGNIFICANT INFORMATION NEEDS FOR THE NORTH ALEUTIAN BASIN

INTRODUCTION

The Alaska Department of Fish and Game (ADF&G) has produced this staff report on information needs pertinent to the North Aleutian Basin (NAB) to assist the Minerals Management Service (MMS) in determining whether there is sufficient information to make a decision on whether or not to hold proposed Outer Continental Shelf (OCS) Sale 92. Although extensive environmental studies have been conducted in the southeastern Bering Sea and Bristol Bay, our review of the available information show few studies have concentrated on the critical nearshore waters in and near the NAB. The department believes that the information needs described in this report must be filled in order to prepare a complete assessment of the potential impacts of oil and gas exploration, development, production, and transportation on fish and wildlife populations, habitats, and harvest activities in the proposed lease sale area. Some of the information needs identified are also essential in assessing the effectiveness of existing mitigating measures, and in developing effective measures to mitigate impacts addressed in the Draft Environmental Impact Statement (DEIS). An accurate evaluation of potential impacts in the NAB is especially critical given the extremely important biological values of the region.

This report focuses only on the most significant information needs, or data gaps, that the department believes must be filled before a decision can be made on whether to conduct an oil and gas lease sale in the NAB. These data gaps do not comprise all of our concerns regarding oil and gas exploration and development in the NAB. They are simply those items for which the department does not believe the MMS can make a responsible assessment of potential impacts, and for which mitigating measures normally utilized by the MMS will not likely alleviate the identified problem. The lack of protection afforded by mitigation has been an important component in deriving these information needs. Consequently, our detailed discussion of these needs is prefaced with a general description of the potential impacts addressed in this paper.

POTENTIAL IMPACTS

Offshore oil and gas exploration and development poses several risks to fish and wildlife, particularly in nearshore marine and estuarine areas. Such potential impacts include, but are not limited to, oil contamination resulting from spills and other accidents, pollution caused by drilling muds and formation waters, habitat alteration resulting from construction activities, and noise and disturbance caused by support activities and seismic operations.

1. OIL CONTAMINATION

Inherent oil pollution risks are associated with exploration, development, production, and oil storage and transport activities. In the NAB, the MMS (1985) has estimated a probability of 0.61 and 0.03 for one or more spills greater than 1,000 barrels and 100,000 barrels, respectively. Many factors determine the magnitude and duration of damage from a petroleum spill including: chemical composition of the oil; size and duration of the spill; seasonal, oceanographic, and meteorological conditions; exposed biota, habitat type, and substrate; geographic location; and the effectiveness of oil spill containment and cleanup actions. Impacts can be either short-term or long-term depending upon such factors as what percentage of a population or its habitat is effected and whether oil is incorporated into the sediments.

The potential clearly exists for catastrophic oil spill impacts to occur in the Bristol Bay vicinity because of the large concentrations of highly vulnerable species. Concerns center on the several million seabirds, over a million northern fur seals, and nearly 20,000 sea otters that inhabit the region, as well as the unique coastal eelgrass marshes on the northern side of the Alaska Peninsula. Seabirds, fur seals, and sea otters are especially susceptible to oil contamination due to their reliance on fur or feathers for insulation. Additionally, seabirds and fur seals are highly concentrated in some areas. Oil contamination of coastal eelgrass beds, such as those found in Izembek Lagoon, could also result in severe impacts on waterfowl. Virtually the entire world population of Pacific black brant, emperor geese, and Steller's eiders could be impacted if these coastal eelgrass beds were contaminated.

Oil spills can also significantly impact species such as finfish, shellfish, and other invertebrates. Impacts can be through direct mortality or chronic sublethal effects. Larval or juvenile stages of many species are particularly sensitive to petroleum contamination. This is especially pertinent to the NAB region, where many species have pelagic egg or larval stages.

Federal regulations and safety precautions designed to prevent oil spills have significantly improved since the early 1970s. However, major oil spills continue to occur, and open ocean containment and cleanup operations have been shown to be ineffectual. This is particularly true under adverse weather conditions and in severe sea states, which

are common in the NAB. Consequently, adoption of oil spill response measures is not likely to provide adequate protection of fish and wildlife should a major oil spill occur.

2. DRILLING MUDS AND FORMATION WATERS

The disposal of drilling muds and cuttings and the discharge of formation waters from offshore platforms can adversely affect fish and wildlife. Drilling muds and cuttings present risks through direct toxicity to marine organisms, bioaccumulation of heavy metals in marine food webs, and the physical burial of benthic habitats. Discharge of formation waters can introduce toxic substances such as hydrocarbons, heavy metals, and occasionally hydrogen sulfide into the marine environment. In addition to water pollution, these substances can cause other changes in water quality, such as oxygen depletion, increased temperature, and altered salinity.

1-1j During the exploratory phase, these impacts are currently minimized through Environmental Protection Agency permit requirements which only allow open ocean disposal of nontoxic drilling muds, place limitations on the number of wells drilled at each site, and require reinjection of formation waters into subsurface rock formations. If commercial quantities of oil are discovered, however, disposal of these substances could present a significant environmental problem because of the large amounts of muds and cuttings and effluent associated with field development. Although measures such as upland disposal of muds and cuttings could mitigate some offshore impacts, implementation of such measures is unlikely because of logistic and economic considerations.

3. HABITAT ALTERATION

Oil and gas activities can impact fish and wildlife resources through habitat alteration. Site preparation for the construction of offshore and onshore facilities (e.g., platforms, supply bases, tanker terminals, etc.) can significantly modify or eliminate natural habitats, thereby affecting species distributions and/or abundance. If the disturbed area is large in comparison to the total available habitat, or if the area altered provides the only suitable habitat for a critical life function(s), the impact to fish and wildlife could be severe.

Oil and gas facilities can also impact habitats beyond the actual construction site. For example, construction of facilities in coastal wetlands can alter the natural hydrology of the surrounding area. Shoreline modifications can cause changes in nearshore circulation patterns and water quality factors such as temperature and salinity. In addition, water pollution from hydrocarbons or other contaminates can potentially cause long-term species community structure and habitat alterations, particularly in shallow embayments such as Izembek Lagoon.

Various techniques can be employed to mitigate habitat alteration impacts resulting from various construction projects. Examples of such techniques include the judicious siting of facilities, modifications in project designs, and oil spill response measures. However, full prevention of impacts is unlikely.

4. NOISE AND DISTURBANCE

The intense level of support activity associated with offshore oil and gas exploration and development can cause varying degrees of disturbance to fish and wildlife. When birds and mammals are disturbed by noise, particularly from aircraft or by human presence, they may abandon favored habitats. The effect(s) of such disturbance can be especially detrimental if it occurs during a critical period in a species life cycle, such as breeding, staging, or pupping. Adverse effects can include direct mortality, decreased reproductive success, and altered physiological and behavioral patterns which, in turn, may lead to decreased survival rates. Moreover, seismic exploration, even with a typical non-explosive energy source, may cause substantial disturbance to schooling fish or marine mammals over a wide area.

Noise and disturbance impacts can be partially mitigated by siting major facilities and traffic corridors away from fish and wildlife concentration areas. However, some level of noise and disturbance is probably inevitable, particularly if terrain or economic considerations make one site much more desirable than another. This is also true where logistic bases are already located near sensitive areas, such as the Cold Bay airport near Izembek Lagoon, or if seismic exploration must be conducted in sensitive areas. In addition, the specific setback distances required to avoid or minimize disturbance to fish and wildlife have not been adequately documented for many species. Consequently, ensuring that appropriate buffers are established is not currently possible in many instances.

INFORMATION NEEDS

1. FISHERIES

a. King Crab

Introduction

The red king crab fishery of the southeastern Bering Sea has, in recent history, been the richest fished by U.S. fleets, with an estimated ex-vessel catch value of $168,700,000 in 1980 (Eaton 1980, Otto et al. 1980a, Otto 1981). Populations from 1978 to 1980 were the highest in ten years (Otto 1981). However, the commercial fishery suffered depressed landings of red king crab the following two years and the fishery was closed in 1983. Marine waters offshore of the western Alaska Peninsula (from Unimak Pass to Port Moller) extending northwest to the Pribilof Islands support 90 percent of the total eastern Bering Sea king crab harvest (Bureau of Land Management 1981).

Although extensive information on red king crab has been collected in this area; the distribution, abundance, and population dynamics in nearshore waters of the North Aleutian Shelf are poorly described (Armstrong et al. 1984). The National Marine Fisheries Service (NMFS) has conducted broad-scale trawl surveys in the southeastern Bering Sea for more than 12 years, and Otto (1981) provides a history of information gathered by Japanese and Russian fleets. However, these efforts have concentrated on adult king crab in waters exceeding 50 meters (m) in depth. They have provided very limited information on nearshore (less than 50 m) distribution, and virtually no information on distribution of first, second, and third year juveniles. Recent studies by Armstrong et al. (1983) and McMurray et al. (1984) addressed these data gaps to a degree, but the results may be unrepresentative because of the currently depressed red king crab population in Bristol Bay.

The NAB lease sale area is extremely important to red king crab because it contains the major reproductive site for the entire Bering Sea (Thorsteinson and Thorsteinson 1984). The highest densities (114,000/100 m^2) of red king crab larvae ever recorded were located in the proposed lease sale area (Armstrong et al. 1983). Larvae are very sensitive to water-soluble fractions of spilled oil, possibly making red king crab the most vulnerable species of economic value to oil and gas development in the NAB (Thorsteinson and Thorsteinson 1984). Additionally, the currently depressed red king crab population is of great concern, because any adverse impacts from oil and gas activities could have a more pronounced and detrimental affect on this already stressed population.

Data Gaps

1-2 (1.) Additional information is needed to accurately assess the potential impacts of oil and gas development activities on developing king crab eggs. An accurate assessment of potential impacts is dependent on obtaining additional information on: 1) the potential for direct hydrocarbon uptake by king crab eggs, 2) the onshore-offshore migratory behavior of egg-bearing female king crab in the NAB, and 3) the potential for hydrocarbon contaminants to inhibit chemoreception capabilities of male king crab in locating females for successful copulation.

The reproductive success of king crab could be affected by uptake of hydrocarbons by eggs from bottom or interstitial waters where sediment hydrocarbons may be high (Armstrong et al. 1983). The accumulation of napthalenes in contaminated waters by brooding eggs of the marine polychaete *Neanthes arenaceodentata* was documented by Rossi and Anderson (1977). However, no studies on direct hydrocarbon uptake by crab eggs have been conducted (McMurray et al. 1984). The risk of hydrocarbon uptake by developing king crab eggs is greatly increased because they are externally brooded for eleven months, thus exposing the eggs to potential hydrocarbon contaminants for an extended period. Additionally, crab eggs are high in lipid content, which enhances accumulation of hydrocarbon fractions.

Although long term hydrocarbon uptake studies have not been conducted on crab, the direct lethal effect of hydrocarbons on developing eggs was shown by Tatem (1977), through exposing egg-bearing shrimp to 1.44 milligrams/liter (mg/l) of water soluble hydrocarbon fractions for 72 hours. After one week, control females released an average 45 larvae each, while those exposed to oil released only 9 each. Studies on the effects of long term exposure and uptake of water soluble hydrocarbon fractions on king crab eggs are warranted because the proposed lease sale area encompasses the major reproductive site for red king crab in the entire Bering Sea.

There is also insufficient information on the onshore-offshore migration pattern of egg-bearing red king crab in the NAB. In the Kodiak region, female king crab exhibit an annual onshore-offshore migration pattern (Powell and Nickerson 1965, NPFMC 1980). Due to limited winter surveys, this behavior is not well documented for the NAB. McMurray et al. (1984) questioned whether females undergo an onshore-offshore migration, and suggested that remaining in warmer nearshore waters would enhance egg development. As

previously stated, females carry the egg clutch for approximately 11 months. During this period, the eggs would be exposed to the uptake of hydrocarbons directly from bottom or interstitial water, where sediment hydrocarbon levels may be high by virtue of processes such as deposition of oil-laden fecal pellets or storm mixing in shallow waters.

Whether or not gravid females exhibit an onshore-offshore migration is important because it affects the potential for increased hydrocarbon exposure periods. The probability for exposure to hydrocarbon contaminants generally increases in nearshore environments, since this is a primary area for deposition of discharged hydrocarbons. Field surveys to document the winter nearshore distribution of egg-bearing female king crab are necessary to fully determine the potential for exposure to hydrocarbon contaminants.

Finally, more information is needed to determine the potential for oil contaminants to impair chemosensory location of females (Armstrong et al. 1983). After molting, a female must be located and mated within five days for viable eggs to be produced (Armstrong et al. 1983). Sexually mature males locate females by strong pheromone cues that are detected by sensitive chemosensory organs.

No studies have been conducted on whether oil contaminated waters impair chemosensory location of females. However, Armstrong et al. (1983) and McMurray et al. (1984) both stated that such an impact could occur. Chemoreceptive organs of juvenile and adult dungeness crab can detect water soluble hydrocarbon fractions as low as 0.1 mg/l, a concentration well within the range of oil spill concentrations (Pearson et al. 1980). Following the *Amoco Cadiz* spill, the numbers of gravid crab and lobster were drastically reduced in 1978 and 1979 along the affected portion of the Brittany coast (Hood and Calder 1981), suggesting that breeding within the population was impaired. These factors support the need for additional research to determine the potential effects of oil contamination on chemosensory organs of king crab.

1-3 (2.) Additional information is needed to fully assess the potential impacts of oil and gas development activities on king crab larvae and juvenile recruitment in Bristol Bay. A responsible assessment of potential impacts is dependent on obtaining additional information on: 1) the nearshore (less than 50 m) distribution of king crab larvae in Bristol Bay, and 2) the importance of protective rearing habitat for young (i.e., first and second-year age class) juvenile king crab.

Accurate knowledge of larval distribution along the North Aleutian Shelf is essential to a determination of potential oil and gas development impacts. The larval stage is the most susceptible life stage to oil perturbations, because of their high sensitivity and inability to avoid hydrocarbon contaminants. An oil concentration between 0.2 and 0.7 parts per million (ppm) is considered acutely toxic to crab larvae (Rice et al. 1983). Moore and Dwyer (1974) noted a sublethal range of 0.011 - 0.1 mg/l as stressful to larvae. Pelagic larvae also exhibit a daily vertical migration through the water column, which increases the potential for exposure to hydrocarbon contamination (Armstrong et al. 1983). During the night, most of the larvae move into the upper 20 m of the water column. These factors are important due to the large area that could be impacted by an oil spill. Armstrong et al. (1983) predicted that an area of 10,000 - 15,000 square kilometers (km^2) might be polluted by oil concentrations lethal to decapod larvae following a large spill event (500,000 bbls). Such a scenario could virtually eliminate an entire year-class of king crab in Bristol Bay.

Recent studies on nearshore king crab larvae distribution in Bristol Bay have produced varying results. Larvae distribution based on data of Armstrong et al. (1983), which was collected from 1976 - 1981, is in accord with results of a 1970 - 1971 survey by Haynes (1974). In these studies, larvae were found relatively nearshore along the North Aleutian Shelf into Bristol Bay, with the highest densities occurring from western Unimak Island to Port Moller. Densities ranging from 5,000 - 50,000 larvae/100 m^2 were typical of this area (Armstrong et al. 1983). Virtually all high density larval stations occurred along the 50 m depth contour, or within a 40 km band seaward of the 50 m isobath. These studies did not include nearshore areas east and north of Port Moller, therefore, the extent and abundance of larvae from Cape Seniavin into Bristol Bay was not documented. To fill this data gap, McMurray et al. (1984) conducted sampling throughout Bristol Bay in 1983. This study found the highest density of crab larvae in the middle of Bristol Bay, between the 50 and 70 m isobath, and a generally low density along the North Aleutian Shelf, as compared to earlier years. In fact, a 33-fold reduction in North Aleutian Shelf larvae in 1983 was a

persistent feature along the entire nearshore survey area during June. This suggests that either extensive reproductive failure and/or high larval mortality occurred, or that the North Aleutian Shelf is not as important to propagation as previously believed (McMurray et al. 1984). McMurray et al. (1984) also stated that the importance of offshore central Bristol Bay as a larval spawning ground should be reconsidered because of the high larval densities recorded there.

To assess potential oil and gas development impacts, the distribution and abundance patterns of king crab larvae must be known. Based upon results of prior studies (Haynes 1974, Armstrong et al. 1983, McMurray et al. 1984), it appears that larval distribution patterns and their relative importance in Bristol Bay are still in question. Additionally, the extremely low larval densities along the North Aleutian Shelf in 1983 signals a dramatic decline in an area traditionally considered the major reproductive site for the southern Bering Sea. Implications of this trend should be fully investigated prior to allowing oil and gas development activities to occur, because such activities could impact important king crab reproductive areas.

Additional information is also needed to determine the relative importance of protective rearing habitat for young juvenile king crab in Bristol Bay. Armstrong et al. (1983) hypothesized that rocky, cobble habitat is critical to benthic survival of young juvenile crabs in this region because it affords protection from predators. Very large populations of predators, coupled with a uniform bottom of mud/sand, would probably result in tremendous predator pressure and low or no survival of first-year crabs. This hypothesis is supported by work conducted by Weber (1967), Jewett and Powell (1981), and McMurray et al. (1984) who all found young king crab associated with protective habitats. Consequently, recruitment of juvenile king crab may not be dependent solely on the size of the larval hatch, but also on the number of larvae that metamorphose over protective habitats and subsequently settle out into these areas.

Michel et al. (1982) predicted that the availability of this protective habitat along the North Aleutian Shelf is relatively rare. Sediment sampling throughout Bristol Bay confirmed that distribution of gravel deposits conducive to providing predator protection is extremely patchy (McMurray et al. 1984). If the hypothesis supporting the importance of protective habitat to juvenile recruitment is accurate, serious impacts from oil and gas development could result if only a small percentage of a larval hatch is impacted by hydrocarbon contamination. Due to the importance of this hypothesis in predicting potential impacts, additional studies are needed to confirm the relationship between protective habitats and juvenile survival.

1-4 (3.) Additional information is needed to assess the potential impacts of oiled sediment on settling and recruitment of food organisms important to juvenile king crab.

Studies prior to McMurray et al. (1984) indicated that a significant proportion of Bristol Bay juvenile and female king crab inhabited nearshore areas along the North Aleutian Shelf (Armstrong et al. 1983). In the event of a major NAB oil spill, this area presents a high probability of being exposed to hydrocarbon pollutants (MMS 1985). Hydrocarbon contamination could affect availability of preferred food sources, thus affecting crab growth and survival in local nearshore feeding and nursery grounds (MMS 1983). Oil spills or chronic discharges in nearshore areas can result in sediments becoming contaminated with hydrocarbons, which may be released slowly. Burns and Teal (1979) reported the persistence of aromatics and napthalenes in Falmouth, Massachusetts sediments eight years after a spill of number 2 fuel oil. This persistence has prevented total recolonization of the sediment (Burns and Teal 1979, Sanders et al. 1980). Additionally, in arctic climates, the lighter and more toxic hydrocarbon fractions remain longer in the sediment than in temperate or tropical climates because of slower reaction rates (Atlas et al. 1978).

Summary

Oil spills and discharges of formation waters or drilling muds, which could amount to several million gallons or several hundred thousand tons, respectively, could present a major risk to NAB king crab populations. In order to adequately assess these risks, additional information must be obtained on: 1) the potential for direct hydrocarbon uptake by developing king crab eggs, 2) the onshore-offshore migratory behavior of egg-bearing female king crab in the NAB, 3) the potential for hydrocarbon contamination to inhibit chemoreception capabilities of male king crab, 4) the nearshore distribution of king crab larvae in Bristol Bay, 5) the importance of protective juvenile rearing habitat, and 6) the effects of oiled sediment on settling and recruitment of food organisms important to juvenile king crab. A cautious approach in evaluating the compatibility of oil and gas development with the king crab fishery of Bristol Bay should be taken because of: 1) the potential value of the fishery, 2) the importance of the NAB as a king crab reproduction area, 3) the vulnerability of king crab to oil contamination, and 4) the current inability to fully assess potential impacts due to the significant data gaps described above.

b. Pacific Salmon

Introduction

Bristol Bay supports the largest sockeye salmon fishery in Alaska and is, in fact, the largest single sockeye salmon producing area in the world (NMFS 1980). Large numbers of king, coho, and chum salmon, as well as some pink salmon are also harvested in Bristol Bay. Villagers from Sand Point to Goodnews Bay, as well as many other Alaskan residents, depend heavily on these stocks for portions of their annual incomes and subsistence needs. The first wholesale value of the Bristol Bay salmon fishery in recent years is estimated to be in excess of $250,000,000 and employs over 10,000 people.

Approximately 88 percent of all salmon entering streams around the Bering Sea pass through North Aleutian Shelf waters on their spawning migration (Thorsteinson and Thorsteinson 1984). The origin of maturing salmon along the North Aleutian Shelf includes a mixture of western Alaska stocks from Kotzebue Sound, Norton Sound, Yukon River, Kuskokwim Bay, and Bristol Bay (Barton, pers. comm.). The migration of Bristol Bay stocks alone include over 60 million adult salmon and several hundred million outmigrating fry.

The impact of petroleum on the behavior and physiology of U.S. salmon is at present poorly understood. This is primarily because of: 1) variability within and among different fish species, 2) variability of hydrocarbon contaminants, and 3) various environmental factors that affect both the fish and the oil (Patten 1977). Although there are considerable data available on the short-term toxicity of various petroleum oils to marine organisms, some rather severe limitations are associated with much of the data. A key problem stems from a lack of experimental standardization, making comparison of results and impact predictions difficult. Additionally, many experiments consider only the toxic effects, whereas a wide range of behavioral and physiological responses are completely ignored.

Data Gaps

(1.) Additional information is needed to adequately assess the potential impacts of oil and gas development activities on seaward migrating juvenile salmon along
I-5 the North Aleutian Shelf. A realistic assessment of potential impacts is dependent on obtaining additional information on: 1) the seaward migration patterns and timing of Pacific salmon in Bristol Bay, and 2) the ability of juvenile salmon to detect and avoid oil contaminated waters.

Little research has been conducted on the seaward migratory phase of Pacific salmon in Bristol Bay. Of the five species of North American Pacific salmon, only the sockeye salmon has been sufficiently studied to describe in limited detail the seaward migration (Hartt et al. 1964, Straty 1974, and Thorsteinson and Thorsteinson 1984). However, ADF&G fishery biologists believe that the seaward migration patterns of sockeye salmon in Bristol Bay are still inadequately documented (Shaul, pers. comm.). Information on the seaward migration of the other species of salmon is fragmentary and has been obtained incidentally from the sockeye studies, or from observations by area fishery managers (Thorsteinson and Thorsteinson 1984). Additionally, the seaward migration routes of salmon from western Alaska have not been documented, but it is believed that they also migrate through Bristol Bay (Barton per. comm.).

Seaward migration patterns of salmon can directly influence a species' vulnerability to oil contamination. The following characteristics of the sockeye seaward migration, as identified by Straty (1974), increases the potential for this species to be impacted by a major oil spill: 1) juveniles are concentrated between the coast and 40 km offshore along the north side of the Alaska Peninsula, 2) they are concentrated in the upper 1 m of water at night and at a depth of 2 m during the day, and 3) the various Bristol Bay stocks may become mixed and concentrated in nearshore waters of the outer bay during late summer. The individual migration behavior of the other juvenile salmon species may not be the same as sockeye salmon. Determining the timing and migration patterns of all juvenile Pacific salmon species is important to assessing potential offshore oil and gas development impacts. For example, pink salmon are generally believed to outmigrate close to the coast (Morrow 1980). If this is true in Bristol Bay, pink salmon

could be more vulnerable than sockeye salmon to oil contamination impacts.

Additional information is also needed to determine the degree that juvenile salmon stocks become mixed in outer Bristol Bay (between 160° W and 164° longitude). The potential for an oil spill to significantly impact outmigrating juvenile salmon has been discounted based upon the assumption that oil would only impact a relatively small number of fish due to the staggered species-specific and stock-specific migration patterns (Thorsteinson and Thorsteinson 1984). The occurrence of different species of juvenile salmon along the North Aleutian Shelf is initially staggered due to the separation of anadromous stream systems and the varying times that each species or individual stocks enter the sea. However, limited data indicate that sockeye stocks may become mixed in outer Bristol Bay as a result of juveniles slowing their migration rate to feed on the abundant food resources found in this region (Straty 1974). Moreover, Thorsteinson and Thorsteinson (1984) indicated that relatively large percentages of seaward migrating juvenile sockeye, chum, pink, and coho salmon stocks may be mixed in outer Bristol Bay during late summer. Thus, an oil spill in late summer could potentially impact a number of salmon species and stocks. Consequently, further studies need to be conducted to determine the level of mixing or concentrating of juvenile salmon stocks in the nearshore waters of outer Bristol Bay.

Determining the length of time that outmigrating juvenile salmon remain along nearshore waters of outer Bristol Bay is also important to assessing potential impacts. Research fishing in NAB waters has not been conducted beyond late September, so there is little direct evidence as to how long juvenile salmon remain abundant in outer Bristol Bay (Thorsteinson and Thorsteinson 1984). Straty (1974) found that the major percentage of seaward migrating sockeye had entered the outer bay after mid-August, and juvenile sockeye continued to be captured through mid-September, which was the last sampling date. Additional sampling must be conducted during the fall and early winter, however, to determine whether juveniles remain in nearshore waters of the outer bay past mid-September and, if so, for how long. This information is important because the length of time that juveniles are concentrated in a limited area directly affects their vulnerability to oil spill impacts.

The second information need pertinent to juvenile salmon is whether they have the ability to detect and avoid oil contaminated waters. Laboratory tests by Maynard and Weber (1981) indicated that over 50 percent of presmolt coho salmon would not have the ability to avoid a potentially toxic concentration of petroleum hydrocarbons. However, these studies did not conclusively determine whether seaward migrating juvenile coho salmon would avoid toxic hydrocarbon concentrations resulting from a crude oil spill. In laboratory studies using pink salmon fry, Rice (1973) found that fry avoided hydrocarbon concentrations of 1.6 milliliters/liter (ml/l) and greater. Although this level is below what is considered acutely toxic, such concentrations could result in sublethal effects to juvenile salmon (Rice et al. 1975a). Maynard and Weber (1981) also noted that there is no published information on the effects of chronic low level oil pollution on juvenile salmon. Furthermore, they stated that there is no information on the consequences of oil spill avoidance, particularly if the avoidance results in habitat displacement. Because of the importance of the North Aleutian Shelf as a migration corridor for juvenile salmon, definitive information is needed on their ability to avoid toxic concentrations of hydrocarbon contaminants.

I-6

(2.) Additional information is needed to determine if a major oil spill could interfere with the spawning migration of adult salmon. To date, it has not been determined whether mature salmon will migrate through petroleum contaminated waterways to reach their natal streams when no alternative waterway is available.

Weber et al. (1981) showed that mature Pacific salmon migrating upstream during the peak of the run substantially avoided a mixture of monocyclic aromatic hydrocarbons in the water at concentrations of 3.2 mg/l and higher. However, the study did not determine whether the salmon would migrate through such contaminated waters if provided no other alternative. This information is relevant because a large oil spill could contaminate the mouths of important Bristol Bay salmon streams. If adult salmon will not pass through such contaminated waters, significant spawning reductions could result within these streams.

The MMS has recognized this information need and an OCSEAP study is scheduled to address this data gap starting in 1985. However, if the study produces definitive results, they will not be available until

late 1986 or early 1987; after the Sale 92 planning process is complete.

I-7

(3.) Additional information on the potential for seismic energy sources to disperse salmon or cause them to dive suddenly is needed to assess oil and gas development impacts on the commercial salmon fishery.

Very limited information is available on this topic. Alaska Department of Fish and Game biologists, while conducting the Bristol Bay Test Fishery in 1983, observed that seismic operations appeared to cause salmon to dive to deeper water. However, this observation could not be statistically verified through analysis of capture data (Meacham, pers. comm.). Fishermen have also complained that seismic surveys conducted in lower Cook Inlet in 1984 caused a dramatic decline in salmon catches while vessels were passing through the fishing grounds. California fishermen have contended for several years that seismic operations disperse large schools of rockfish, which results in lowered harvests for several days following seismic operations (Vesco, pers. comm.). Because of the importance of the Bristol Bay salmon fishery and the perceived potential for seismic operations to interfere with harvest activities, additional studies need to be conducted to define the potential for seismic operations to disrupt normal fish behavior patterns.

The Pacific Region of MMS is currently participating in studies off the coast of California to assess disturbance effects of seismic airguns on rockfish. Results of these studies could be applicable to this important data gap. However, no results have been released to date and if conclusive results are obtained, the study is not scheduled to be completed until 1987; after the Sale 92 planning process is complete.

Summary

Oil and gas development in the NAB may present a significant risk to the Bristol Bay salmon fishery. In addition, this risk could also extend outside of Bristol Bay due to the utilization of the North Aleutian Shelf for migration by a mixture of western Alaska salmon stocks. In order to reasonably evaluate the potential risk to salmon stocks, additional information must be obtained on: 1) the seaward migration patterns and timing of Pacific salmon in Bristol Bay, 2) the ability of juvenile salmon to detect and avoid oil contaminated waters, 3) whether adult salmon will migrate through oil contaminated waterways, and 4) the potential for seismic activities to disrupt normal fish behavior patterns and, consequently, interfere with commercial salmon harvests. Due to the economic importance of the Bristol Bay salmon fishery, and the need for additional information to fully assess potential impacts, careful consideration should be given to the compatibility of oil and gas development activities with this valuable renewable resource.

c. <u>Pacific Herring</u>

Introduction

The NAB and adjacent areas support several commercial fisheries for food and bait herring, as well as sac roe. Herring stocks that comprise the 3,200 metric ton food and bait fisheries in Unalaska and Akutan Bays (Shaul et al. 1983) apparently pass through and feed within the NAB during annual migrations (Meacham, pers. comm.). Available data strongly suggest that these are mixed stocks of eastern Bering Sea Pacific herring mainly of Bristol Bay origin (Lebida et al. 1984a). Conservative estimates based on data obtained during the last 7 years place the eastern Bering Sea stocks at a spawning migration biomass of 80,200 - 258,000 metric tons which provided for a commercial fishery catch of 7,300 - 34,000 metric tons worth an ex-vessel value of $3 - 14 million (Lebida et al. 1984b). The several hundred ton sac roe fishery in the Port Moller/Herendeen Bay area (Shaul et al. 1983) relies on stocks utilizing the NAB. More importantly, this fishery relies on stocks that congregate in shallow waters in the NAB for spawning and, therefore, are particularly vulnerable to potential oil spill impacts.

Several surveys have been conducted to delineate spawning areas for herring (Barton et al. 1977, Warner and Shafford 1981). These studies have determined that herring congregate in large masses, measuring many tons, and spawn on intertidal and subtidal vegetation such as rockweed (<u>Fucus</u> sp.) and eelgrass (<u>Zostera marina</u>) in several areas along the coast, particularly in Port Moller and Herendeen Bay.

Data Gaps

1-8 (1.) <u>Additional information is needed to accurately assess the potential impacts of oil and gas development activities on juvenile and adult herring</u>. A reliable assessment of potential impacts is dependent on obtaining additional information on: 1) the distribution and abundance of spawning herring, 2) the distribution of larval herring in surface waters after

hatching, 3) the distribution and abundance of adult herring outside of the spawning season and, 4) the migration pathways of juvenile and adult herring.

Although several surveys have been conducted on forage fish in the North Aleutian Shelf area (Barton et al. 1977, Warner and Shafford 1981), fishery management biologists believe that spawning areas for herring have not been adequately documented (Shaul, pers. comm.). Moreover, the original investigators acknowledge that further definition of spawning areas is needed (Barton et al. 1977, pers. comm.). The distribution of larval herring is also poorly documented. Waldron (1981) reported that very few larval herring have been captured in plankton surveys in the southeastern Bering Sea, and suspects that the scarcity of samples is due to the fact that few surveys have been conducted in nearshore waters adjacent to spawning areas. In addition, there is almost no information regarding abundance or stock size of Pacific herring in the NAB (Wespestad and Barton 1981, Thorsteinson and Thorsteinson 1984), even though commercial and subsistence fisheries currently rely on these stocks (ADF&G 1982). Finally, additional work needs to be done to confirm migration pathways through the NAB of herring stocks which spawn elsewhere in Bristol Bay and the eastern Bering Sea.

Herring have been shown to be acutely sensitive to contamination by hydrocarbons at several life stages (Rice et al. 1975b, Struhsaker 1977, Rice et al. 1979, Smith and Cameron 1979, and others), including demonstrated effects on survival of ovarian eggs, embryos, and larvae, as well as incorporation of hydrocarbons into adult body tissues (Rice et al. 1978). Herring are particularly vulnerable to contamination by oil because adults spawn in dense aggregates in intertidal and shallow subtidal waters, leave eggs attached to aquatic vegetation or rocks in these areas, and produce larvae that remain in surface waters prior to metamorphosing into juveniles. Moreover, adult herring may over-winter in nearshore waters adjacent to spawning areas (Wespestad and Barton 1981), making them vulnerable to oil contamination throughout much of the year. These factors support the need for additional information on several aspects of herring distribution and abundance.

1-9 (2.) <u>Additional information is needed to assess the potential impacts of oil and gas development activities on spawning substrates (Fucus, Zostera) used by herring</u>. A credible assessment of potential impacts is dependent on obtaining information on: 1) the effect of oil pollution on the productivity of marine plants, 2) possible mortality of these plants due to oil contamination, and 3) the effects of oil pollution on possible recolonization of previously oiled areas by marine plants.

Preliminary studies on the effects of oil contamination of eelgrass, Zostera marina, indicate that exposure to hydrocarbons can result in significant reduction in productivity (McRoy and Williams 1977). However, no other studies on contamination of eelgrass and seaweeds, including kelps and Fucus which herring use as spawning substrate, have been documented in the recent NAB Synthesis Report (Thorsteinson 1984).

Eelgrass is both an annual and perennial plant, reproducing both by seed and vegetative means. Eelgrass grows in intertidal and subtidal areas, sometimes in massive beds such as those found in Izembek Lagoon. These seagrasses rely on marine sediments for nutrients. Many kelps, including Fucus, are annual plants that attach to rocky substrates. Oil contamination of these plants, particularly those used by herring for spawning, is likely if an oil spill reaches the shoreline. Contamination may reduce productivity of these plants, cause outright mortality, and alter sediment or rock substrates so that recolonization by plants may be hindered. If the growth of these plants is affected or the plant surfaces are contaminated, the reproduction of Pacific herring will likely be adversely affected.

Summary

Pacific herring support a lucrative commercial fishery and is an important link in the trophic food chain in the southeastern Bering Sea. Over the past five years, the herring fishery in the eastern Bering Sea has had an average estimated value of $7,977,860 for sac roe and spawn on kelp (Lebida et al. 1984b). Herring are also an important prey item for groundfish, salmon, marine mammals, and marine birds.

Although contamination from discharges of produced waters, drilling muds and bilge water may adversely affect herring populations, major oil spills probably present the greatest risk. Current oil spill cleanup technology cannot effectively control the risks to herring from large operational or other major oil spills. In order to assess the risks to herring populations, information must be obtained on: 1) the distribution and abundance of adult,

juvenile, and larval Pacific herring in the NAB, and 2) the effects of oil contamination on herring spawning substrates and juveniles. The need to gain further information on herring has been partially recognized by the MMS, through continued funding for studies on "Lethal and Sublethal Effects of Spilled Oil on Herring Reproduction (MMS 1983). However, if the studies produce conclusive results, they will not be available until late 1985 or early 1986; after the Sale 92 planning process is concluded.

d. Capelin

Introduction

Many of the studies conducted to determine distribution of spawning herring also defined some intertidal capelin spawning areas along the north Alaska Peninsula (Barton et al. 1977, Warner and Shafford 1981). Capelin are known to also spawn subtidally.

Capelin are a very important forage fish for seabirds, marine mammals, and salmon. They are widely distributed in the eastern Bering Sea and constitute the second most abundant fish species, after herring, encountered in nearshore studies (Barton et al. 1977). They are a highly marketable species and support very large fisheries in the Atlantic Ocean and the Barents Sea. In 1984, a "major" fishery for capelin developed in northern Bristol Bay (ADF&G 1984), and plans have been formulated for commercial harvests in Norton Sound (Arctic Sea 1983). Therefore, there is a potential for capelin to support a future commercial fishery along the north Alaska Peninsula (Barton et al. 1977), where 18 tons were taken in 1983 (Shaul et al. 1983).

Capelin gather in immense schools during spawning, and swim onto the beaches during spring high tides to bury eggs in the substrate. These eggs incubate at a shallow depth in the beach substrate for several weeks. Upon hatching, larvae drift back into nearshore waters through the surf, and remain in shallow nearshore waters until cold temperatures force them to deeper water in fall (Warner and Shafford 1981).

Capelin would be particularly vulnerable to adverse effects from oil spills because they aggregate in immense numbers in shallow water to spawn, deposit their eggs on exposed sand and gravel beaches, and produce larvae that remain in surface waters. Moreover, spawning beaches may become contaminated by oil, making them unsuitable for capelin reproduction for many years.

Data Gaps

1-10 (1.) Additional information is needed to fully assess the potential impacts of oil and gas development activities on juvenile and adult capelin. A responsible assessment of potential impacts is dependent on obtaining additional information on: 1) the distribution and abundance of adult capelin, 2) delineation of nearshore spawning areas, and 3) the distribution and migration patterns of larval and juvenile capelin.

Surveys of forage fish have determined that capelin are abundant and widely distributed in the eastern Bering Sea. However, the authors of recent reports concluded that surveys have provided a low estimate of abundance, and that little is known about capelin distribution at times of year other than the spawning season (Barton et al. 1977, Warner and Shafford 1981). Given the importance of this species to marine food webs and to potential commercial fisheries, it is important that basic distribution and abundance information be obtained to provide some assessment of the risks posed by oil and gas exploration and development. Further delineation of spawning habitats and identification of juvenile rearing areas is particularly important, because capelin are likely to be most vulnerable to oil contamination during these life stages.

1-11 (2.) Additional information is needed to fully assess the potential impacts of oil and gas development activities on the spawning substrates (sand and gravel) of capelin. A reasonable assessment of potential impacts is dependent on obtaining additional information on: 1) the vulnerability of capelin spawning beaches to oil contamination, 2) incorporation of pollutants into beach substrates, and 3) the persistence of contaminants in these substrates.

Large schools of capelin typically spawn on exposed sand and gravel beaches. These beaches have been characterized as coastal environments highly susceptible to long-term oil spill damage from penetration of oil into the substrate (Hayes et al. 1976). However, little work has been performed on the possible short or long-term effects of oil contamination of capelin spawning areas. It is expected that oil will penetrate into sand and gravel beaches and persist for several years (Sanborn 1977).

Since capelin spawn in high concentrations on exposed beaches and likely use the same beaches year after

year, contamination of a spawning beach could have long-term effects on the reproduction of a large segment of available capelin stocks. In order to assess risks of oil contamination of spawning substrates, information must be obtained on the vulnerability of capelin spawning beaches to contamination, incorporation of pollutants into beach substrates, and the persistence of contaminants in those substrates.

1-12 (3.) Additional information is needed on the toxic effects of hydrocarbons on all life stages of capelin to fully assess the potential impacts of oil and gas activities.

Various studies have documented the lethal, and in some cases the chronic sublethal, effects of oil contamination on some life stages of Pacific herring and other nearshore fishes. There is little documentation, however, on the effects of oil contamination on the various life stages of capelin. Neither is there any reference to such information in the recent NAB Synthesis Report (Thorsteinson 1984).

Capelin are extremely vulnerable to hydrocarbon contamination as adults during spawning aggregations, as eggs and embryos in beach substrates, and as juveniles in nearshore waters. Consequently, information must be obtained on the toxic effects of hydrocarbons on capelin in order to adequately assess the risks of oil and gas exploration and development to this important forage fish.

Summary

Due to their relative abundance in the southeastern Bering Sea, capelin are an important forage fish and a potentially important commercial species. As with herring, major oil spills probably present the greatest risks to capelin populations. In order to assess such risks to capelin populations, information must be obtained on: 1) the distribution and abundance of spawning and other life stages of capelin, 2) the effects of oil contamination on capelin spawning substrates, and 3) the effects of oil contamination on various life stages of capelin.

e. Pacific Sand Lance

Introduction

Sand lance are an extremely important forage fish for seabirds, marine mammals, and many finfish including salmon. Sand lance larvae have been found to make up 50 percent of the spring diet of herring in the North Sea (Trumble 1973) and 38.9 percent of the juvenile coho salmon diet in Bristol Bay (Straty and Jaenicke 1971). In 1960, sand lance composed 37 percent of the stomach contents of the pelagic fur seals sampled in Alaska, ranking it among the leading food items (North Pacific Fur Seal Commission 1962).

Sand lance are not only valuable as a forage species, but they are also a target for commercial fisheries in Europe and Japan. In Europe, sand lance is substituted for herring in the production of fish meal and oil, and in Japan it is boiled or dried and used for human consumption (Trumble 1973). Consequently, the potential exists for a sand lance fishery to develop in the southeastern Bering Sea.

Although many investigators have commented on the large numbers of sand lance found in Alaskan waters, very little quantitative or qualitative information is available (Macy et al. 1978). They are most abundant in depths less than 50 m (Shuntov 1963), and abound along sandy beaches and offshore sand bars (Clemens and Wilby 1961). Sand lance are believed to have specific spawning grounds where the eggs are buried in the sand (Trumble 1973). However, the location, timing, and depth of such spawning areas have not been documented for the Bering Sea.

Sand lance are particularly vulnerable to adverse impacts from oil spills because they are known to school in large numbers in nearshore waters, deposit their eggs in subtidal or possibly intertidal waters, and spend significant portions of time buried in bottom substrates. Moreover, spawning areas could become contaminated by oil, making them unsuitable for reproduction for many years.

Data Gaps

1-13 (1.) Additional information is needed to fully assess the potential impacts of oil and gas development activities on all life stages of sand lance. A responsible assessment of potential impacts is dependent on obtaining additional information on: 1) the distribution and abundance of adult, juvenile, and larval sand lance, and 2) delineation of spawning areas.

We are currently unaware of any published reports documenting the distribution of sand lance along the north shore of the Alaska Peninsula. However, it has been suspected that substantial concentrations inhabit this region, because of the large numbers of seabirds occurring in the area. Preliminary results of the 1984 catch data for an ongoing OCSEAP/NOAA study, examining

nearshore pelagic fish distribution along the north shore of the Alaska Peninsula, found sand lance to be the most abundant species. Out of a total capture of 88,252 fish, 55,277 were estimated to be sand lance (Isakson, pers. comm.). Given the importance of this species to marine food webs, it is essential that key spawning areas are located and basic distribution and abundance data for adults, juveniles, and larvae are obtained to provide an assessment of risks posed by oil and gas exploration and development. Detailed delineation of spawning habitats and larval rearing areas is particularly important, because of the vulnerability of these life stages to oil contamination.

1-14 (2.) Additional information is needed to fully assess the potential impacts of oil and gas development activities on the spawning substrates (sand and gravel) of sand lance. A reasonable assessment of potential impacts is dependent on obtaining additional information on: 1) the vulnerability of sand lance spawning areas to oil contamination, 2) incorporation of pollutants into bottom substrates, and 3) the persistence of contaminants in these substrates.

It is currently unknown where sand lance spawn along the north coast of the Alaska Peninsula. Trumble (1973) stated that spawning takes place at depths of 25 to 100 meters in areas having strong currents. Sand lance spawning has been documented in lower intertidal areas near Kodiak in late fall (Dick and Warner 1982). Coarse sands have been identified as the best spawning substrate. Hayes et al. (1976) identified coastal areas composed of coarse sands as being highly susceptible to long-term oil spill damage from penetration of oil into the substrate. However, no work has been performed on the possible short or long-term effects of oil contamination of sand lance spawning areas. As previously stated, oil will likely penetrate into sand and gravel beaches and persist for several years (Sanborn 1977).

Because sand lance are believed to spawn in high concentrations in intertidal or subtidal gravel substrates and likely use these areas year after year, contamination of these substrates could have a long-term effect on their reproductive capability. In order to assess the risks of oil contamination of spawning substrates, information must be obtained on the vulnerability of sand lance spawning areas to contamination, incorporation of pollutants into intertidal and subtidal substrates, and the persistence of contaminants in those substrates.

I-15 (3.) Additional information is needed on the toxic effects of hydrocarbons on all life stages of sand lance to fully assess the potential impacts of oil and gas development.

Documentation exists on the lethal, and in some cases chronic sublethal, effects of oil contamination on certain life stages of Pacific herring and other nearshore fishes. However, no documentation exists on the effects of oil contamination on the various life stages of sand lance.

Sand lance are vulnerable to hydrocarbon contamination as adults during feeding and spawning aggregations, as eggs in bottom substrates, and as larvae and juveniles in nearshore waters. Additionally, sand lance exhibit a behavior of burrowing into nearshore and intertidal gravel substrates during resting periods (Dick and Werner 1982), which would further increase their potential exposure to hydrocarbon contamination. Consequently, information must be obtained on the toxic effects of hydrocarbons on sand lance in order to adequately assess the risks of oil and gas exploration and development to this important forage fish.

Summary

Sand lance is an extremely important component of the trophic food chain in the NAB. If the relative abundance of sand lance in the NAB is as high as indicated by preliminary studies, major impacts to sand lance could be extended to species in the upper trophic levels which heavily utilize them. Additionally, the potential may exist for a commercial sand lance fishery to develop in this region.

Sand lance are vulnerable to oil spills and discharges of formation waters and drilling muds associated with oil and gas development. Current oil spill cleanup technology cannot effectively control the risks to sand lance from major oil spills. Important sand lance spawning grounds or resting areas, where they burrow into bottom substrates, could also be impacted by discharges of formation waters or drilling muds, which can amount to several million gallons or several hundred thousand tons, respectively. In order to assess these risks to sand lance populations, information must be obtained on: 1) the distribution and abundance of spawning adults and other life stages, 2) the effects of oil contamination on spawning substrates, and 3) the effects of oil contamination on various life stages.

2. BIRDS

Introduction

The southeastern Bering Sea and adjoining coastal areas provide important habitats for many of Alaska's most impressive and important marine and coastal bird resources. Over 75 species of waterfowl, seabirds, and shorebirds regularly breed, migrate through, or overwinter in this region. A majority of these birds are migratory and are therefore managed and protected under the International Migratory Bird Treaty Act of 1918, as amended. Migratory birds start arriving in the area in early April and depart by mid-November. The Bristol Bay region is most heavily used by waterfowl for staging purposes during the spring and fall migrations. During the fall migration, an estimated 11.6 million birds rely on Bering Sea habitats (King and Dau 1981)

The lagoons adjacent to the NAB support waterfowl concentrations of regional, national, and international significance. The extreme dependence of certain waterfowl species on these lagoons, particularly Izembek, is reflected in the high percentages of North American populations that utilize them. Virtually the entire world's population of black brant, estimated during the winter of 1984-85 at 131,000 (Conant and Eldridge 1985), and the world's entire population of emperor geese, estimated at 71,000 (Dau 1984), stage at Izembek and adjacent lagoons from September through early November. Izembek Lagoon also supports large concentrations of Taverner's Canada geese, estimated at 44,000 birds (± 13%) (Conant et al. 1984), and hundreds of thousands of ducks of several species. Small numbers of cackling Canada geese and the endangered Aleutian Canada geese also use the lagoon. Many of these ducks and geese are taken for subsistence uses in Alaska, and are also harvested by recreational hunters from Alaska to Mexico.

Several of the above mentioned species, notably black brant, emperor geese, and cackling Canada geese, have been declining in population. A significant decline in the black brant population has occurred over the past five years, and emperor and cackling Canada geese have been declining over the last two decades. These population declines have gained international attention. As a result, major conservation efforts are now underway throughout the Pacific Flyway in an attempt to arrest the declines and to rebuild the populations to sustainable levels. One particularly notable example is the cooperative effort of Pacific Flyway states and countries to institute special hunting regulations for black brant. To date, Washington and Oregon have closed hunting of black brant, Mexico and California are continuing to limit brant harvests, and the association of Village Council Presidents for the Yukon-Kuskokwim region have agreed to reduce subsistence harvesting of black brant in their area. In addition, it has been agreed that should the 3-year average of black brant fall below 120,000 birds, all brant hunting along the Pacific Flyway would be prohibited. The most recent three-year average is 121,262 birds and, based on the 1984 Yukon-Kuskokwim breeding survey, there were significantly fewer nesting birds in 1984 than in 1983 (Garrett and Wege 1984).

In addition to the lagoons, seabirds and some waterfowl species rely heavily on offshore areas of the southeastern Bering Sea for feeding. Densities of seabirds in the pelagic waters are highest in summer and fall, when up to 250 birds per km^2 have been surveyed (Strauch and Hunt 1981). However, few pelagic surveys of marine birds and waterfowl have been conducted to evaluate avian use of the North Aleutian Shelf, and fewer still have been conducted during winter (Arneson 1981).

In general, there appears to be considerable information available on the life histories of most waterfowl and marine bird species. Site specific information on the distribution and abundance of these birds is frequently lacking, however, or of a more generalized nature. In addition, some information is available on the potential effects of oil and gas development on waterbirds. For instance, it is well documented that waterfowl and seabirds are sensitive to, and potentially impacted by, noise, disturbance, and oil contamination. Available information on noise and disturbance, however, shows that the degree of sensitivity varies by species, life stage, and time of year (Rothe pers. comm.). For example, black brant are known to be extremely sensitive to disturbance during the molting and staging periods. Although there appears to be a substantial amount of information documenting the sensitivity of waterfowl to disturbance, in actuality there are still major gaps in our knowledge and understanding.

V-25

Data Gaps

1-16 (1.) Insufficient information is available to accurately assess the potential impacts of oil and gas-related disturbance on staging waterfowl, particularly black brant and emperor geese, in the Izembek-Port Moller area. A responsible assessment of potential impacts is dependent on obtaining a quantitative assessment of: 1) the short and long-term biological effects of disturbance on avian populations, and 2) the altitude or distance at which staging waterfowl reactions to

aircraft disturbance and other sources of noise and movement are sufficiently minimized.

Of the studies completed to date on the effects of noise and disturbance, a majority address the effects of aircraft disturbance (Derksen et al. 1979, 1982, Schweinsburg 1974, Simpson et al. 1982, 1984). Fewer studies have been performed on the effects of human presence, drilling operations, and compressor station noises on the various waterfowl species (Barry and Spencer 1976, Gollop and Davis 1974, Gollop et al. 1974, Kiera 1979, Pacific Waterfowl Flyway Council 1981).

The fall staging period is a critical phase in the annual cycle of waterfowl because the birds are replenishing fat reserves for the southward migration. Black brant, in particular, are known to be extremely sensitive to disturbance during staging. If brant and emperor geese are subjected to extensive disturbance during this time, they may fail to build up the necessary fat reserves to migrate successfully, resulting in further population declines.

Currently, lease stipulations are in effect which are meant to minimize the effects of aircraft disturbance on waterfowl. These guidelines include altitude restrictions of 1,500 feet and/or avoiding bird concentrations by a horizontal distance of one mile. Recent observations, however, indicate that these stipulations have not been effective in preventing disturbance of black brant or emperor geese.

First, it appears that the current altitude and lateral distance requirements are inadequate to prevent disturbance of brant or emperor geese. Biologists at Izembek Lagoon have noted that large flocks of black brant are taking to the air each time a helicopter passes over the lagoon, even when above the designated altitude. In addition, the overflight of a single rotary-winged aircraft flying at 1500 - 2000 feet displaced a group of several hundred brant and emperor geese from feeding areas approximately two miles away. These birds remained airborne for up to 10 minutes (Derksen pers. comm.). As a result, state and federal biologists are concerned that this additional energy expenditure may prevent birds from acquiring the necessary fat reserves to migrate successfully, which could ultimately increase mortality rates. No conclusive information is currently available, however, to determine at what elevation or lateral distance helicopters can safely pass over or around Izembek

Lagoon without causing disturbance to black brant or emperor geese. Clearly, additional research on disturbance thresholds is needed in order to ensure that aircraft overflight restrictions are adequate to protect staging brant and emperors in the Izembek Lagoon vicinity and elsewhere along the Alaska Peninsula.

Secondly, although the U.S. Fish and Wildlife Service has identified visual flight corridors that avoid Izembek Lagoon, they can only be used when weather conditions permit. Unfortunately, in a great majority of the flights from the St. George Basin to Cold Bay, weather conditions requiring Instrument Flight Rules (IFR) are encountered (Exxon Co. 1984). Because of the location and alignment of the Cold Bay airport, the prevailing winds, and Federal Aviation Administration required IFR procedures, there is frequently no safe alternative to flying over Izembek Lagoon. As a result, there currently appears to be no satisfactory way to minimize the impacts of aircraft disturbance to staging birds in Izembek Lagoon, and assure the protection of already declining waterfowl populations. A similar data gap exists for other oil and gas activities and facilities with high levels of noise and disturbance, which may periodically occur or be constructed in essential waterfowl habitat.

V-26

I-17 (2.) Additional information is needed on the distribution and abundance of overwintering seabirds and waterfowl in the NAB to fully assess the potential impacts of oil and gas development.

As noted earlier, few surveys have been conducted to delineate winter distribution and abundance of seabirds and waterfowl. Although the few winter surveys available indicate much lower densities of birds than in fall, some areas may contain extremely dense winter concentrations, such as the 3,240 birds per km^2 reported for a 2.5 km^2 area near Samalga Island (Arneson 1981). Further evidence that large numbers of birds may use the NAB during winter comes from observations of a "wreck" of seabirds, where an estimated 100,000 murres died from severe winter storms in outer Bristol Bay in 1970 (Bailey and Davenport 1972). During the non-breeding season, marine birds and waterfowl likely spend most of the time on the surface of the water, rather than attending nests on cliffs and other upland areas, and are, therefore, more vulnerable to oil contamination.

The potential for impacts to bird populations could be significant because of: 1) the severe climatic conditions in the NAB during winter and the resulting increased likelihood of oil spills, 2) the limited effectiveness of oil spill containment and cleanup measures, especially in severe sea states, and 3) the undetermined potential for large groups of birds to be densely aggregated on the water surface. In order to evaluate the risk to bird populations from a winter oil spill or other catastrophe, more information needs to be obtained on the distribution and abundance of birds in the North Aleutian Shelf area during winter.

Summary

There are currently lease stipulations in effect designed to minimize the impacts of aircraft disturbance on waterfowl. However, recent observations indicate that present altitude and lateral distance requirements are inadequate to prevent disturbance. Moreover, flight rules and human safety considerations often override agreements to maintain these buffers. Additionally, the risk of a major oil spill accompanies actions to develop oil and gas resources. In order to adequately assess the risks, to seabirds and waterfowl, associated with such development, additional information must be obtained on: 1) disturbance of aircraft and other oil and gas activities on staging waterfowl, particularly black brant and emperor geese, and 2) winter distribution and abundance of seabirds and waterfowl.

3. MARINE MAMMALS

Introduction

The diversity and seasonal abundance of marine mammals in the southeastern Bering Sea is unparalleled anywhere in Alaska, and perhaps the world. The ecological significance of this region to marine mammals is not yet fully understood, but in terms of species abundance and diversity it is a region of primary importance. At least 20 species of marine mammals are known to occur in the NAB vicinity. Approximately 4,000 sea lions, 30,000 harbor seals, 15,000 walrus (primarily males) and 17,000 sea otters utilize Bristol Bay habitats during all or part of the year (Frost et al. 1983). All marine mammals are protected under the Marine Mammal Protection Act of 1972. Some species (e.g., gray whale, fin whale, humpback whale) are also protected under the Endangered Species Act of 1973.

Unimak Pass, which is adjacent to the lease sale area, is the major migratory corridor for numerous species of marine mammals moving into and out of the Bering Sea. Virtually the entire eastern Pacific gray whale population, estimated at 15,000 - 17,000 individuals, and approximately 1.2 million northern fur seals use the pass during their spring and fall migrations (Rugh and Braham 1979, Leatherwood et al. 1983). Unimak Pass is also regularly used by fin, minke, humpback, and killer whales, but the specific movement patterns of these species are poorly documented. Resident species in the vicinity of Unimak Pass include Steller sea lions, harbor seals, and possibly killer whales (Everitt and Braham 1980, Braham et al. 1980).

Offshore oil and gas exploration and development in the Bering Sea may have two types of effects on marine mammals: 1) those associated with hydrocarbons which are released into the environment, and 2) those related to disturbances which may affect the behavior and distribution of animals. Possible impacts of oil pollution have been discussed by Davis and Anderson (1976), Geraci and Smith (1976, 1977), and Cowles et al. (1981). Results available to date are inconclusive, although some physiological effects have been documented. Effects of oil on prey species of Bering Sea marine mammals were discussed in detail by Lowry et al. (1981), which concluded that: "...based on what information is available, a real potential for detrimental effects on prey populations exists, especially in species such as herring, capelin, and arctic cod which aggregate to spawn in habitats susceptible to contamination by oil."

V-27

Disturbance responses of cetaceans are difficult to observe and quantify. Indications are, however, that distribution and movement patterns of whales are closely correlated with changes in human activities and associated boat traffic (Frost et al. 1983, Nishiwaki and Sasao 1977). The actual effects of responses to disturbances are not well known. However, "changes in distribution and abundance which prevent a species from exploiting its potential food resources in the most efficient manner will result in long-term changes in productivity, survival, and abundance (Frost et al. 1983)."

Data Gaps

I-18 (1.) <u>Additional information is needed to adequately assess the potential impacts of oil and gas activities on the eastern Pacific gray whale population</u>. A reliable assessment of potential impacts is dependent on obtaining additional information on: 1) the effects of oil contamination on gray whales, 2) the importance of the North Aleutian Shelf as a "migratory" feeding area, and 3) the effects of seismic operations and industrial noise on gray whale feeding behavior.

Additional information is needed on the effects of oil on gray whales, either from direct contact or as a result of indirect effects through changes in food supplies. The National Marine Fisheries Service (NMFS 1984) concluded that: "...an uncontrolled blowout or major oil spill in the waters of the southeastern Bering Sea during peak migration periods of gray whales is likely to jeopardize the continued existence of the species." Evidence exists that whales do not necessarily avoid oil contaminated water (Goodale et al. 1981). The effects of oil on potentially sensitive tissues such as the skin, eye, or respiratory system are not well defined. Albert (1981) stated that adverse effects of oil contact with bowhead whales could include: 1) conjunctivitis and corneal inflammation leading to reduced vision and possibly blindness, 2) development of skin ulcerations from existing eroded areas on the skin surface, with subsequent possibility of bacteremia, and 3) development of bronchitis or pneumonia as a result of inhaled irritants. In relation to indirect effects, oil spills or chronic discharges in nearshore areas can result in sediments becoming contaminated with hydrocarbons. Such contamination could affect the availability of preferred food items along the North Aleutian Shelf. Because virtually the entire eastern Pacific gray whale population passes along the North Aleutian Shelf during their spring migration, it is important that we fully understand the potential direct and indirect effects of oil contamination on these whales.

Determining the significance of the North Aleutian Shelf as a "migratory" feeding area and the relative importance of this area to the overall eastern Pacific gray whale population is another information need. Although small numbers of gray whales have been reported feeding in nearshore waters during migration and while on the breeding grounds (Sund 1975, Darling 1977, Wellington and Anderson 1978, and Norris et al. 1982), the majority are not known to begin feeding intensively until they reach the northern Bering Sea (Rice and Wolman 1971, Zimushko and Ivashin 1980, Lowry et al. 1982). However, Gill and Hall (1983) reported that once gray whales moved into nearshore and estuarine waters along the north side of the Alaska Peninsula, many of them began feeding. During three spring aerial surveys, 50-80 percent of the whales seen within 1 km of shore between Unimak Pass and Naknek were trailing mud plumes or were on their sides characterizing feeding behavior (Gill and Hall 1983). This observation is important because it indicates that a significant percentage of the eastern Pacific gray whale population may utilize coastal areas along the North Aleutian Shelf for "migratory" feeding. Additional studies are needed to provide accurate estimates of: 1) the number of gray whales that utilize this area as feeding habitat, 2) the length of time that feeding occurs in the area, and 3) the principle prey species.

The relative importance of such "migratory" feeding areas to the overall population is currently unknown. Gill and Hall (1983) suggested that the use of such feeding areas might be a requisite for survival, due to several prior months of near fasting and the energy demands resulting from a long migration. Determining the relative importance of the North Aleutian Shelf as a "migratory" feeding area would be difficult, however, this information is fundamental to an accurate impact assessment.

Additional information is also needed to determine the effects of seismic operations and industrial noise on gray whale feeding behavior. A large proportion of the gray whale population may feed along the North Aleutian Shelf, while some whales feed in this area throughout the summer months (Gill and Hall 1983). Prior studies have addressed behavioral reactions of migratory gray whales to playback of acoustic stimuli associated with oil and gas exploration and development activities (Malme et al. 1984). These studies showed that gray whales demonstrate avoidance behavior at distances of 1.1 km and 2.5 km from simulated drillship sounds and a 4,000 cubic inch seismic array, respectively. Nishiwaki and Sasao (1977) also showed that distribution and movement patterns of whales are closely correlated with changes in human activities and associated boat traffic. Because of the potential importance of the North Aleutian Shelf as a "migratory" feeding area, information is needed to determine if similar avoidance reactions are exhibited by feeding gray whales, and if they will abandon traditional feeding areas because of industrial noise.

The MMS has recognized this information need and an OCSEAP study is currently investigating the behavioral responses of feeding gray whales to acoustic stimuli (MMS 1983). However, if the studies produce conclusive results, they will not be available until late 1985 or early 1986; after the Sale 92 planning process is complete.

1-19 (2.) Determining the migratory behavior of the North Aleutian Shelf sea otter population is necessary to fully assess the potential impacts of oil and gas development in the NAB.

Sea otter census surveys were conducted by Cimberg et al. (1984) in the North Aleutian Shelf during 1982-1983. Aerial surveys were flown in June, August, October, and March to investigate seasonal changes in sea otter habitat use. During 1982-1983, significantly more sea otters were observed in August (10,325) than either March (1,454), June (1,880) or October (4,737), where population counts were not significantly different from each other. Summer values (July 30 and 31, 1976) collected by Schneider (1976) were higher (11,681) but not statistically different. To account for these changes in seasonal abundance, Cimberg et al. (1984) proposed that sea otters were migrating from the North Aleutian Shelf via False Pass into the Pacific Ocean.

Adequate information is not currently available to substantiate the hypothesis that large numbers of sea otters migrate through False Pass. Such migrational behavior has not previously been documented for Alaska sea otter populations, nor have direct observations been made of large migrations through False Pass (Schneider pers. comm.). Survey biases, including poor visibility or non-uniform distribution of sea otters, as noted by Schneider (1976) and Cimberg et al. (1984), could have affected the 1982-1983 results. The non-uniform distribution is important, because only a single survey per season was conducted, which covered approximately 7.1 percent of the total study area. Sea otters are known to aggregate into large groups or "pods" which may exceed 1,000 animals in size (Schneider pers. comm.). Such large aggregations of animals in a finite area can significantly bias aerial surveys which cover limited percentages of a study area. Additional surveys should be conducted at False Pass during periods of assumed migrations before final conclusions are drawn on sea otter migration behavior along the North Aleutian Shelf.

Sea otters are probably the most vulnerable of all marine mammals to the direct effects of oil. Accurate knowledge on their year-round distribution and abundance along the North Aleutian Shelf is essential to an accurate assessment of potential impacts of oil and gas development activities on sea otters.

Summary

The abundant marine mammals in the southeastern Bering Sea are an important resource to the state. While major features of the distribution and biology of these species are well known, specific information on their utilization of coastal and offshore waters of Bristol Bay is generally not available. Potential effects of OCS exploration, development, and production activities on marine mammals include not only chronic and catastrophic discharges of hydrocarbons into the environment, but also disturbance factors associated with both onshore and offshore activities.

The North Aleutian Shelf is especially important to gray whales and sea otters. It is a major migration corridor for gray whales, as well as a potentially important feeding area. The rich benthic community of the region supports a very dense population of sea otters, which has been estimated at 17,000 animals. In order to assess the potential risks posed by oil and gas development to these populations, additional information must be obtained on: 1) the effects of oil on cetaceans, 2) the importance of the North Aleutian Shelf as a gray whale "migratory" feeding area, 3) the effects of noise on gray whale feeding behavior, and 4) the migratory behavior of sea otters along the North Aleutian Shelf.

4. HABITATS

Introduction

The bays and lagoons of the northern Alaska Peninsula constitute a major portion of the total estuarine habitat in the Bering Sea. These areas are known for their high productivity. Izembek Lagoon contains the largest eelgrass stand in the world. Microbial degradation of eelgrass detritus is a major lagoonal process affecting most trophic relationships and energy transfers among lagoonal inhabitants. Eelgrass leaves support large numbers of epiphytic organisms with a total biomass perhaps approaching that of the eelgrass itself. Food webs are very short in the lagoon, and in most cases consist of fewer than six intermediate species. Shrimp, crab, juvenile fish, and an abundance of other invertebrates are dominant species. In addition, the bays and lagoons are critical habitat for many species of shorebirds and waterfowl, which use them for staging in spring and fall (Thorsteinson 1984).

As previously mentioned, eelgrass is both an annual and perennial plant, reproducing both by seed and vegetative means. It grows in intertidal and subtidal areas, relying on marine sediments for substrate and some nutrients. Despite the high productivity of this sea grass, any

disruption of the beds could have serious deleterious effects on the coastal environment.

There is little data available concerning the effects of hydrocarbon contamination on eelgrass (<u>Zostera marina</u>). Available information on other seagrasses indicates that the toxicity of oil and the recovery time for oiled marsh ecosystems vary. Determining factors include the type of oil spilled (e.g., crude, no. 2 fuel oil, no. 6 fuel oil, etc.) and the exposure time. Of the few studies performed specifically on <u>Zostera</u>, one, a laboratory experiment; indicated that exposure to hydrocarbons inhibits productivity (McRoy and Williams 1977). Another study found that eelgrass accumulated significant levels of hydrocarbons when growing in oiled sediments (Vandermeulen and Gordon 1976).

Data Gap

I-20 (1.) <u>Additional information is needed on the type and duration of potential oil spill impacts on important eelgrass beds, particularly in Izembek Lagoon, if possible risks are to be adequately evaluated</u>.

Oil contamination of eelgrass beds is likely if an oil spill reaches the northern shoreline of the Alaska Peninsula. Contamination may reduce productivity of these plants; cause outright mortality, and alter substrates so that recolonization by plants may be hindered. If the growth of these plants is affected, or the plant surfaces are contaminated, the implications could be severe. For instance, the world populations of black brant and emperor geese rely on Bristol Bay eelgrass beds, particularly those found in Izembek Lagoon, as a primary food source prior to their strenuous fall migration. As previously noted, both of these populations are already declining. Any reduction in the productivity of essential eelgrass beds could ultimately cause irreparable damage to these species of international importance.

Summary

In order to adequately protect this critically important habitat, and the species dependent upon eelgrass beds, it is essential that there be a better understanding of the potential effects of oil contamination on these plants and their substrates, and the means by which potential impacts can be mitigated.

5. OIL SPILL CLEANUP ANALYSIS

Introduction

The capability to effectively respond to a major spill is a key element in assessing the potential impacts of oil and gas exploration and development. This is especially true when activities are to be conducted in an area as biologically rich as the Bristol Bay region. Many of these biological resources; such as the 1.2 million northern fur seals, 17,000 sea otters, several million seabirds, virtually the entire world populations of black brant, emperor geese, and Steller's eiders, and the world's largest eelgrass beds, are extremely vulnerable to oil spills. Consequently, an accurate evaluation of the probability of conducting a successful major open ocean oil spill cleanup operation is germane to deciding whether to allow oil and gas leasing in the NAB.

As a result of increased public awareness and concern over the effects of major oil spills in the 1960's and 1970's, the oil and gas industry has spent considerable sums of money to develop open ocean oil spill containment and recovery equipment. In recent years, increasing reliance has been placed on industry's capability to contain and cleanup spilled oil as a means of protecting environmental resources. However, considerable debate exists regarding the capability to successfully respond to major open ocean oil spill events. A ten-year overview of oil spill cleanup at sea (White et al. 1979) concluded that recovery of significant quantities of oil from the open sea has never been achieved during a major spill.

The oceanographic and meteorologic conditions, as well as the logistically remote location, of the NAB also present barriers to effective oil spill response actions. For example, wave heights in the NAB exceed 2 m approximately 50 percent of the time, and visibility is less than a fourth of a nautical mile approximately 30 percent of the time (Brower et al. 1977). Such conditions severely hinder oil spill response actions.

Data Gap

I-21 (1.) A compilation and analysis of information relating to oil spill response capabilities is necessary to accurately assess the potential for successful open-ocean spill response actions in the NAB.

To date, an analysis of oil spill response capabilities in the NAB has not been conducted. Considerable information is available that should be utilized in this analysis. This information includes: 1) Coast Guard oil spill logs and response capability evaluations for major oil spill events in U.S. waters, 2) reports on international oil spill events and subsequent cleanup efforts, 3) oil spill response exercises conducted by the Coast Guard and the oil industry, 4) manufacturer equipment specifications, 5) oil spill behavior reports, 6) industry oil spill contingency plans, and 7) meteorological and oceanographic studies of the NAB. The analysis should not only focus on equipment capabilities, but also on the capability to deploy equipment and to logistically support cleanup operations.

Through developing and analyzing several oil spill scenarios, including considerations for logistics, personnel, weather, sea state, and equipment, a reasonable assessment could be made of the capability to respond to a major NAB oil spill event. The MMS is currently planning a study of this nature for the Bering Sea Region. An objective study is warranted since the MMS's DEIS for Sale 92 states that "risks from oil spills would be mitigated... by any oil spill counter-measures which would be attempted" (page xviv). However, no information is provided as to how effective such attempts might be in the NAB.

Summary

The NAB and adjacent waters support large fish and wildlife populations of regional, national, and international importance. Many of the species such as marine birds, waterfowl, fur seals and habitats such as Izembek Lagoon might suffer major long-term damage from a large oil spill. Through careful regulation the incidence of major spills can be minimized but not eliminated. The mitigating measures for a major oil spill are: 1) the MMS's OCS drilling regulations, 2) the MMS and State standards for oil spill contingency plans, and 3) the effectiveness of offshore cleanup activities. There is considerable difference of opinion as to whether or not there is existing technology to contain and cleanup a major offshore spill. An accurate and objective analysis of existing capability is therefore essential to: 1) evaluate the potential effects of a major oil spill, 2) evaluate the effectiveness of oil spill response plans as a mitigating measure, and 3) establish realistic standards for oil spill response plans.

NAB INFORMATION REVIEW SUMMARY

The information needs identified in this report are crucial to a comprehensive environmental impact assessment of oil and gas

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exploration, development, production, and transportation in the NAB. Several of the information needs also involve potential impacts on fish and wildlife, which do not appear to be presently mitigatable. Others, such as the effectiveness of offshore oil spill response measures, must be met before adequate mitigating measures can be developed. Acquiring the data identified is particularly essential in the NAB, because of the tremendous biological productivity of Bristol Bay and the importance of regional fish and wildlife resources to both the local and state economies. The significance of several of the information needs has already been recognized by the MMS, and OCSEAP studies have been funded to address some of the data gaps. However, the ongoing investigations are scheduled to continue through at least 1985. Consequently, it is not possible to incorporate the final results of these research projects, if they prove to be conclusive, into the NAB environmental impact assessment.

It is also important to note that only specific information needs are addressed in this paper. Other broader data gaps also exist, such as: 1) transport mechanisms of oil to the benthos and estimates of quantities of oil which would reach the benthos under a variety of spill conditions, 2) determination of oil degradation and environmental recovery rates for key marine environments particularly intertidal, shallow sub-tidal, or productive benthic habitats, and 3) how the use of dispersants would affect the previously discussed factors. However, this report has attempted to address only specific data gaps that are essential to a responsible impact assessment, and for which mitigation proposals will not likely alleviate the identified problem. The limited time available to prepare this analysis also placed constraints on the amount of information the department could address. Moreover, this paper should not be interpreted as a summary of all significant environmental concerns associated with oil and gas exploration and development in the NAB. Additional concerns that should be carefully considered are included in the department's comments on the DEIS.

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ENCLOSURE 2

Recommended Revisions to the Sale 92 Proposed Mitigating Measures

As previously noted, there is ample evidence to suggest that deferral of Sale 92 until at least 1994 is in the best interest of the State and the Nation. However, if the Department of Interior (DOI) decides to proceed with the lease sale, it is essential that several revisions be incorporated into the proposed mitigating measures. Consequently, we have prepared comments on the proposed mitigation.

As proposed, the mitigation measures contained in the draft Environmental Impact Statement (EIS) are insufficient. Only five stipulations are proposed. All of the other measures are merely advisory in nature, including most of the measures to protect fish and wildlife resources. The DOI should develop specific mitigating measures and incorporate them as enforceable lease terms to ensure that impacts on fish and wildlife resources, directly related to the DOI's lease sale, are minimized. In light of recent problems with St. George Basin helicopter overflights disturbing staging waterfowl in Izembek Lagoon, we encourage the DOI to improve its monitoring and enforcement of existing stipulations and Information to Lessees (ITLs). The DOI should also meet with lessees, contractors, the State and affected communities prior to approval of exploration and development plans to ensure that all stipulations and ITLs are fully understood. Finally, we recommend that the MMS inspectors be better trained to recognize and report violations of lease sale stipulations and ITL's. Comments on specific mitigating measures proposed in the draft EIS are presented below.

- STIPULATIONS -

I-22

Stipulation No. 1 - Protection of Cultural Resources

To ensure all pertinent information on cultural resources is considered by lessees, the State recommends that the following underlined sentence be incorporated into provision (2)(a) of proposed stipulation No. 1:

> Prior to commencing any operations, the lessee shall prepare a report, as specified by the RSFO, to determine the potential existence of any cultural resource that may be affected by operations. The report, prepared by an archaeologist and a geophysicist, shall be based on an assessment of data from remote-sensing surveys and other pertinent cultural and environmental information including archaeological and historical sites delineated in the Aleutians East Coastal Management Plan. The lessee shall submit this report to the RSFO for review.

I-23

Stipulation No. 2 - Orientation Program

The stated mitigating effect of this stipulation is that, "it would make workers aware of the special environmental, social, and cultural values of the regional residents and the environment. It also would provide necessary information to personnel which could reduce behavioral disturbance to wildlife and reduce conflict between the commercial fishing industry and the oil and gas industry "(pages II-C-3&4). For workers to effectively "reduce conflicts" resulting from of oil and gas activities they must be informed of the mitigative measures imposed on their operations as well as the unique environmental, social and cultural values present in the region. Consequently, the State recommends that the orientation program be expanded to include presentations and information on all pertinent lease sale operating stipulations and ITL provisions in addition to stipulations applied to subsequent exploration and development plan approvals. The program should be designed to increase the sensitivity and understanding of personnel for mitigative measures which have been required to reduce or eliminate adverse effects resulting from oil and gas activities in the North Aleutian Basin (NAB).

I-24

Stipulation No. 3 - Protection of Biological Resources

As presently written, the Regional Supervisor of Field Operations (RSFO) is not required to consult with the Bering Sea Biological Task Force (BTF) in implementing the stipulation. We concur with the DOI's determination that: "The involvement of the Bering Sea BTF in the implementation of this stipulation would help to ensure that current, comprehensive biological information is available to the Minerals Management Service (MMS) and that concerns of other appropriate agencies are considered" (page II-C-12). Consequently, to ensure that the BTF is consulted, the State recommends that the following underlined sentence be incorporated into the second paragraph of Stipulation No. 3:

> "Based on any surveys which the RSFO may require of the lessee or on other information available to the RSFO on special biological resources, the RSFO may require the lessee to: (1) relocate the site of operations; (2) establish to the satisfaction of the RSFO, on the basis of a site-specific survey, either that such operation will not have a significant adverse effect upon the resource identified or that a special biological resource does not exist; (3) operate during those periods of time, as established by the RSFO, that do not adversely affect the biological resources; and/or (4) modify operations to ensure that significant biological populations or habitats deserving protection are not adversely affected. In making such a determination, the RSFO will consult with and

consider recommendations from the Bering Sea Biological Task Force."

Stipulation No. 4 - Wellhead and Pipeline Requirements

It is likely that the Aleutian East Coastal Management Plan will
be approved and in effect by the time leasing occurs in the NAB.
The Aleutian East Coastal Management Plan currently includes a
1-25 Policy G-6 for offshore pipelines, G-7 affecting offshore
structure debris, and G-8 affecting pipeline location. Each
should be addressed in the final wording of Stipulation No. 4.
At a minimum, the State believes the Aleutian East Coastal
Resource Service Area Board should be consulted by the RSFO
regarding any proposed pipelines.

Stipulation No. 5 - Transportation of Hydrocarbons

1-26 As recommended under Stipulation No. 4, the Aleutian East Coastal
Resource Service Area Board should be consulted and provided the
opportunity to identify preferred pipeline corridor(s).

- INFORMATION TO LESSEES -

Information on Coastal Zone Management

This ITL should be revised to advise lessees that the Alaska Coastal Management Program does contain policies and standards which are relevant to exploration, development and production activities associated with leases resulting from the lease sale. In addition, language should be included as follows:

> Lessees are advised that the State of Alaska will review the
> lessee's consistency certification accompanying oilspill
> contingency plans specifically for consistency with the
> State's Coastal Management Program and may not concur with a
> 1-27 lessee's certification of consistency for those plans under
> section 307(c)(3) of the Coastal Zone Management Act unless
> they are adequate to ensure consistency with the State's
> program. The State has advised the Minerals Management
> Service that the State's review will consider the use of
> best available and safest technologies for operating in the
> North Aleutian environment, and development of contingency
> plans in the event of an oil well blowout, including relief
> well plans, and the lessee's ability to timely initiate
> oilspill recovery operations, as required by applicable U.S.
> Coast Guard or State regulations, utilizing, to the extent
> necessary and prudent, prestaged clean-up equipment to
> protect areas of special biological sensitivity.

The language as provided above is similar to that provided under Information on Oilspill Contingency Plans in the Norton Sound, Navarin Basin and St. George Basin Notice of Sale (NOS).

Information on Areas of Special Biological Sensitivity

The ITL covering Information on Areas of Special Biological
Sensitivity should be modified to include Amak Island and the
adjacent Sea Lion Rocks. Amak Island provides nesting habitat
for over 10,000 seabirds and is utilized by Steller sea lions,
and occasionally by walrus, as a haul-out area. Sea Lion Rocks
is the only large sea lion rookery along the northern Alaska
Peninsula and, since 1975, up to 2,000 sea lions have hauled out
1-28 on these rocks annually. Approximately 2,500 seabirds also nest
on the cliffs of Sea Lion Rocks. Consequently, it is appropriate
to acknowledge these islands as Areas of Special Biological
Sensitivity.

It should also be noted that the ITL for Areas of Special Biological Sensitivity has incorrectly identified Walrus Islands as a State game refuge and Cape Newenham as a State game sanctuary. Walrus Islands is a sanctuary and Cape Newenham is a refuge.

Lastly, a statement should be added at the end of the ITL as follows:

> "Due to the sensitivity and vulnerability of these areas to
> spilled oil, special attention will be given to deployment
> 1-29 plans and time requirements on the review of oil spill
> contingency plans. Such protection should not include
> dispersant usage unless such usage has been approved in
> advance."

This provision is identical to language found in the St. George Basin NOS.

Information on Bering Sea Biological Task Force

There is no need to diminish the State's interest and role in the
proceedings of the Bering Sea Biological Task Force by
"encouraging" its attendance. Instead this ITL should be revised
1-30 to show that the Regional Supervisor, Field Operations (RSFO)
should consult with representatives of the State of Alaska and
local communities who can contribute to the biological
evaluations. This same provision was included in the St. George
NOS.

Information on Bird and Marine Mammal Protection

The ITL covering Information on Bird and Marine Mammal Protection should also be revised to establish a flight corridor around Izembek Lagoon when large numbers of waterfowl are present. This ITL currently recommends that aircraft maintain a 1,500 foot vertical distance from observed or known wildlife concentrations, which would include waterfowl assemblages in Izembek Lagoon. However, recent experience with helicopter flights over the lagoon in support of OCS exploration activities in the St. George Basin, indicates that this overflight requirement is not sufficient to prevent disturbance to black brant and emperor geese. Virtually the entire world populations of these two
1-31 species stage in the Izembek Lagoon vicinity during fall. Moreover, black brant are known to be very sensitive to disturbance during the fall staging period, and both of these important species have recently experienced population declines. Considering these factors, the State recommends that this ITL be made a stipulation and lessees be required to avoid the lagoon, rather than fly over this area, when large numbers of waterfowl are present.

Lessees should also be advised that the Aleutians East Coastal Resource Service Area Board is particularly concerned about aircraft flights over Moffett Lagoon, Big Lagoon, Hook Bay, St. Catherine's Cove and Swanson Lagoon. The Aleutian East Coastal Management Plan currently contains overflight policies for these special areas which should be addressed in the final wording of this mitigation measure.

Information on Endangered Whales

Both ITL's dealing with impacts to endangered whales from either noise-producing operations or probable oil spill risks should be made stipulations of the NOS. Such a stipulation was included in the Navarin Basin NOS. The State would expect endangered whales in the NAB be afforded the same level of stipulatory protection as provided in the Navarin Basin, absent information to the contrary. We propose the following language:

1-32

"Lessees are advised that the RSFO has the authority and may limit or suspend oil and gas drilling activities on any lease whenever endangered (especially gray or right) whales are present and near enough to be subject to probable oilspill risks. Exploratory drilling, testing, and other downhole activities below a predetermined threshold depth, with the exception of testing through casing, shall be prohibited whenever gray or right whales are in the vicinity of the drilling operation. Such prohibition would continue until it is determined that the whales are outside of the zone of probable influence or are no longer subject to likely risk of oilspills, unless the RSFO determines that continued operations are necessary to prevent a loss of well control or to ensure human safety. This authority is very broad and shall be exercised to the full extent necessary to protect the gray and right whale. Once terminated, pursuant to this stipulation, exploratory drilling operations shall not resume until it is determined by the RSFO, after conferring with the National Marine Fisheries Service (NMFS), that gray and right whales are unlikely to be affected by operations."

Information on Potential Gear Conflict with Commercial Fishing Industry

It would be more effective if this ITL were made a stipulation and lessees were required to keep commercial fishermen advised of activities to avoid fishing gear conflicts. Lessees should also be required to have available information on important commercial fishing areas to identify areas of high potential for gear conflicts.

The problem of gear vessel conflicts could also be reduced by
1-33 circulating applications for seismic surveys to State and local governments for review and comment, and by adopting the following two provisions:

1) Restrict seismic surveys to the seasons or periods when commercial fisheries are closed and there is no gear in the water.

2) If surveys must be conducted during fishing periods, restrict operations to daylight hours and require the use of trained observers to steer seismic vessels around fixed gear.

Information on Oilspill Contingency Plans

An additional ITL should be included in the NAB NOS consistent with its inclusion in the Norton Sound, Navarin Basin and St. George Basin NOS as follows:

"Lessees are notified that oilspill contingency plans are
1-34 required under Alaska Outer Continental Shelf (OCS) Region OCS Order No. 7, pursuant to the authority prescribed in 30 CFR 250.11, 250.34, and 250.43, prior to approval of exploration plans and development and production plans. Furthermore, lessees are required under 30 CFR 250.34-2 to include in development and production plans, descriptions of all vessels, pipelines, and other facilities, and descriptions of all environmental safeguards. Prior to approval of development and production plans the RSFO will

review these items to determine whether those oil transportation facilities described which are regulated by MMS can safely transport oil in conditions expected in the leased area."

Lessees should be informed of the State's review of oilspill contingency plans with reference to the ITL on coastal zone management.

<u>Comments on the Sale 92 Draft EIS Resource Assessment and Fisheries Harvest Discussion</u>

Over all, the Sale 92 draft EIS provides an adequate summary of most of the key fish and wildlife resources and harvest activities in the proposed sale vicinity. However, portions of the resource assessment are difficult to evaluate because many of the terms are not clearly defined. For example, the fisheries harvest discussion refers to salmon harvested in Bristol Bay and along the north Alaska Peninsula, as well as in specific fishing districts. But it is frequently unclear exactly what areas are being addressed. Additionally, there are several deficiencies in the resource assessment pertinent to evaluating the leasing proposal, which should be noted. Specific comments, including examples, are presented below.

1-35

1. It appears that at least portions of the resource assessment and harvest discussion are based on the original sale area boundaries, rather than the current Sale 92 planning area. Because of this, portions of the assessment are confusing and inaccurate.

   Example: "Except in northwestern Bristol Bay, where large colonies are located, the contribution of breeding birds to density north of the peninsula is relatively slight, <u>and the lack of open water in winter precludes high density over much of the lease area during that season</u> (emphasis added)" (page III-B-19). This statement is essentially true for the original sale area, which extended into northern Bristol Bay. However, in most years, ice cover in Bristol Bay does not extend as far south as the current lease sale area. Consequently, this statement is not accurate in relation to the revised lease sale proposal.

1-36

   Example: "A right whale was sited in the lease area at 58°32'N, 167°32'W (Berzin and Rovin, 1966)" (page III-B-29). Again, this statement refers to the original sale area. The current lease sale proposal does not extend as far north as 58°32' or as far west as 167°32'.

2. The resource assessment does not include pertinent information on several fish and wildlife species, which should be addressed in the draft EIS. In some instances, this appears to be the result of not incorporating recently available data.

1-37

   Example: The recently established capelin fishery in Bristol Bay is not discussed in the harvest section.

In 1984, a fishery for capelin developed in northern Bristol Bay; and there is a potential for capelin to support a future commercial fishery along the north Alaska Peninsula, where 18 tons were taken in 1983. Capelin are a highly marketable species and support very large fisheries in the Atlantic Ocean and the Barents Sea. Considering this, the department believes it is appropriate to address capelin in the harvest discussion, and acknowledge the potential for a capelin fishery in the Sale 92 vicinity.

1-38 Example: The resource assessment does not mention the importance of the southeastern Bering Sea as a rearing area for Pacific Ocean halibut populations. Approximately 24 percent of the halibut between ages 5 and 12 that rear in the Bristol Bay region return to the Pacific Ocean through Unimak Pass. This information is germane to the draft EIS impact assessment, because a major oil spill event could potentially impact halibut populations that are harvested far from the Bristol Bay region.

1-39 Example: On page III-B-13, the draft EIS states that the eastern Bering Sea halibut stock "remains depleted." Although this was true a few years ago, the population has been increasing in recent years and this is no longer an accurate statement.

1-40 Example: The resource assessment also fails to identify the importance of the lower Alaska Peninsula to breeding Aleutian terns. Approximately 1,000 Aleutian terns breed in the Port Moller vicinity, which represents over 50 percent of the entire Aleutian tern population. The Izembek Lagoon and Port Heiden areas also provide breeding habitat for this species.

3. The resource assessment frequently fails to acknowledge the limitations of available data, when appropriate. As a result, reviewer's may not be aware that some of the environmental information may be inadequate to conduct a responsible impact assessment.

1-41 Example: The MMS synthesis report for the NAB states that: "The distribution, abundance and population dynamics of red king crab in nearshore waters of the North Aleutian Shelf are poorly described. Despite many crab surveys in the southeastern Bering Sea, little work has been done shoreward of the 50- to 60-m isobaths." However, the draft EIS resource assessment for king crab does not mention this need for nearshore data. In fact, the draft EIS assessment (page III-B-16

through III-B-17) gives the impression that the nearshore population dynamics of red king crab are well defined in the NAB.

1-42 Example: Prior OCSEAP studies (Research Unit 613) funded by the MMS have stated that the southbound migration route for gray whales is poorly documented, but appears to be less coastal and more diffuse than in spring. The draft EIS assessment fails to acknowledge this lack of information in its discussion of the gray whale's southbound migration route (page III-B-32).

1-43 Example: The MMS synthesis report for the NAB states that: "Of the five species of Pacific salmon inhabiting the Bering Sea, only sockeye salmon have been studied sufficiently to describe in some detail their seaward migration. Information on the seaward migration of the other species of salmon from Bristol Bay and salmon from streams draining the north side of the Alaska Peninsula is fragmentary and obtained incidentally from the sockeye studies (Straty 1974; Straty and Jaenicke 1980; Straty 1982) or from casual observations by area fishery managers." Again, the draft EIS assessment does not acknowledge this lack of information in its discussion of seaward migration routes of juvenile salmon (pages III-B-2 through III-B-6). Several citations are cited on this topic providing the impression that extensive research has been conducted in this area. In fact, the majority of information known to date, on the seaward migration of Pacific salmon in Bristol Bay, originates from a single study (Straty 1974).

In conclusion, it is important to understand that the draft EIS resource assessment covers an extremely large region, and does not adequately focus on areas of primary biological concern. Although it is important to consider the region-wide implications of the lease sale proposal, it is equally important to highlight areas warranting special consideration. In the NAB vicinity, there are three particularly productive and sensitive areas which should be specifically acknowledged. These areas are identified and discussed in Enclosure 4.

ENCLOSURE 4

Areas of Primary Concern in Relation to Proposed Sale 92

The southeastern Bering Sea is one of the most productive fish and wildlife resource areas in the State. In some respects, the biological importance of this region is unparalleled anywhere in Alaska and perhaps the world. Although the Sale 92 draft EIS provides a summary of fish and wildlife resources in the southeastern Bering Sea, it does not highlight areas of primary concern in relation to the lease sale proposal.

Three areas that warrant special consideration, which should be specifically acknowledged, include: 1) Bering Sea coastal habitats along the western Alaska Peninsula, 2) Unimak Pass, and 3) the Pribilof Islands. These areas provide particularly critical fish and wildlife habitats for a variety of species.
I-44 These species are not only of regional and state-wide importance but, in some cases, of international significance. Consequently, the Department of Fish and Game has prepared an overview of key fish and wildlife resources in these areas. The State believes it would be beneficial to all interested parties if the DOI were to include a similar overview in the final EIS documents.

1. Bering Sea Coastal Habitats Along the Western Alaska Peninsula

Diverse and abundant assemblages of marine birds regularly breed, migrate through, or overwinter in the NAB vicinity. Major portions of several waterfowl populations utilize relatively restricted areas along the north side of the Alaska Peninsula during certain phases of their annual cycles. Virtually the entire world populations of black brant and emperor geese stage at Izembek and adjacent lagoons from September through early November. More than 60,000 Steller's eiders have been reported in these lagoons during the mid-July to mid-October molting period, and a majority of the world population winters along the Alaska Peninsula. A group of approximately 400 to 700 tundra swans also remain in the region during the winter, primarily at Peterson Lagoon in Urilia Bay, Unimak Island (Sarvis pers. comm.) In addition, approximately 1,000 Aleutian terns breed in the Port Moller area, which represents over 50 percent of the entire Aleutian tern population. The Izembek Lagoon and Port Heiden areas also provide breeding habitat for this species.

The lagoon systems adjacent to the NAB also support large concentrations of Taverner's Canada geese, and hundreds of thousands of ducks of several species. Smaller numbers of cackling Canada geese and endangered Aleutian Canada geese as well as several species of shorebirds, also use these

lagoons. One of the primary reasons why these lagoons support such high densities of marine birds is the presence of extensive eelgrass beds, which provide, directly or indirectly, an abundant food supply for migrating birds. Eelgrass beds are found along the northern Alaska Peninsula from Bechevin Bay to Port Moller, with the largest beds in the world occurring in Izembek Lagoon. The importance of these lagoonal ecosystems has long been recognized. Izembek Lagoon has been classified a State Game Refuge, and Port Moller is a designated State Critical Habitat Area. Nearby coastal waters are equally important for king eiders and scoters (Bureau of Land Management 1981).

Marine bird abundance along the north shore of the Alaska Peninsula is greatest during the spring and fall migration periods. In April and May, 200,000 birds have been recorded for this area, with highest densities occurring in Izembek Lagoon (358 birds/km^2) and Nelson Lagoon (849 birds/km^2). Over 1 million birds have been recorded along the north shore of the Alaska Peninsula during fall. Similar to spring distributions, highest fall densities occurred in Izembek Lagoon (1,044 birds/km^2) and Nelson Lagoon (746 birds/km^2). Large concentrations of marine birds were also noted in Port Moller (618 birds/km^2) (Bureau of Land Management 1981).

Numerous species of marine mammals also inhabit the nearshore waters and coastal areas of the western Alaska Peninsula. This area is of particular significance for sea otters, Steller sea lions, and gray whales. Over the past 70 years, sea otter populations in the Bering Sea have been recovering from overexploitation during the 1700's and 1800's. Approximately 17,000 - 18,000 otters currently inhabit the area. Highest densities occur along the western Alaska Peninsula from Cape Mordvinof to Cape Leontovich. Sea otters are year-round residents, and critical life functions (e.g. pupping) take place along this section of coastline. Steller sea lions also occur along the western Alaska Peninsula. Breeding and haul out areas for this species extend as far northeast as the Lieska Cape vicinity. Sea lions feed in this area too, primarily in water depths of less than 300 feet and within 15 miles of the shoreline. An estimated 15,000 - 17,000 endangered gray whales annually migrate through Unimak Pass and follow the northern coast of the Alaska Peninsula in their passage through Bristol Bay. Recent observations indicate that some gray whales also summer in the Port Moller/Cape Seniavin region. During the fall southward migration, it appears that a portion of the population follows a coastal migratory route, while other individuals take a more direct path across the Bering Sea.

Nearshore waters of the Bering Sea, including those along the western Alaska Peninsula, constitute critical migration and rearing habitat for salmon. All five species of Pacific salmon occur in the Bering Sea. Sockeye salmon are particularly abundant. An estimated 5.6 to 65.9 million adult salmon and 145 to 939 million juvenile salmon enter the Bering Sea Shelf annually (Straty 1981). In the spring, juvenile salmon leave their natal streams and move into nearshore waters where they feed and grow. Typically, juvenile salmon move along the southeast side of Bristol Bay and the north side of the Alaska Peninsula. During this seaward migration, they concentrate in the upper 5 meters of the water column, with greatest densities occurring between 18 km to 55 km offshore (NOAA 1981). Many move through Unimak Pass and other Aleutian passes into the Pacific Ocean. Adult salmon are also found in nearshore waters in the vicinity of their natal streams before moving inland to spawn. Numerous anadromous streams are present along the northern shore of the Alaska Peninsula from Unimak Pass to Port Moller.

Besides salmon, the crab and groundfish resources located in the NAB vicinity are extremely valuable renewable resources. The nearshore waters along the western Alaska Peninsula are an important reproductive and nursery site for many species. Maximum densities of king crab are generally found up to 160 km offshore between Unimak Pass and Port Heiden. In January, adults begin concentrating in nearshore waters from Amak Island to the Port Heiden vicinity to molt, breed, and spawn (Bureau of Land Management 1981). Larvae, which reach peak abundance from early May to mid-July, occur in large concentrations along the North Aleutian Shelf from Unimak Island into Bristol Bay (NOAA 1981). Although virtually no information is available on the distribution of first, second, and third year juveniles, it is assumed that they are restricted to the nearshore area. Bristol Bay is also an important rearing area for most commercially harvested groundfish species (i.e., Pacific halibut, Pacific cod, yellowfin sole, walleye pollock).

2. Unimak Pass

At least 20 species of marine mammals, are known to occur in and near the NAB. Unimak Pass is an important migration corridor for a wide variety of these mammals when moving into and out of the Bering Sea. Migrational use of the pass by gray whales, an endangered cetacean, and northern fur seals is particularly noteworthy. The entire eastern Pacific gray whale population, which consists of approximately 15,000 to 17,000 animals, enter and leave the Bering Sea almost exclusively through Unimak Pass. An

estimated 1.25 million northern fur seals, representing about 74 percent of the world population, also migrate primarily through Unimak Pass on their way to and from the Pribilof Islands (NOAA 1981). Resident species in the vicinity of Unimak Pass include Steller sea lions and harbor seals (Everitt and Braham 1980). Ugamak Island, located in Unimak Pass, is an important pupping area for sea lions, and is one of the two largest sea lion breeding rookeries in the eastern Aleutian Islands (NOAA 1981).

In addition to its importance to marine mammals, Unimak Pass is also used heavily by marine birds. It is a major migratory corridor for waterfowl and shorebirds during both spring and fall. Large aggregations of seabirds, particularly shearwaters, are frequently found in and near the Pass. A mean population estimate of 1.1 million shearwaters has been recorded for Unimak Pass in the fall (NOAA 1981). The mean density of all marine birds in Unimak Pass during the summer is 224 birds/km^2, which corresponds to a population estimate of over 700,000 birds (NOAA 1981).

3. Pribilof Islands

The Pribilof Islands are probably the most important area for marine mammals and seabirds in the Northern Hemisphere (Sowls et al. 1978). From May to November, approximately 1.25 million northern fur seals breed and pup on the Pribilof Islands. As previously noted, this represents about 74 percent of the world population of this species. Over 200,000 fur seal pups are born on the Pribilofs each year (NOAA 1981). During breeding and pupping, fur seals concentrate primarily near the Islands. After pups are weaned, females and subadults move further offshore to feed.

In addition to fur seals, Steller sea lions and harbor seals are also found on the Pribilof Islands. Walrus Island is a sea lion breeding rookery, and approximately 1,500 harbor seals inhabit the area year around. Ribbon, bearded, and spotted seals frequently occur in the vicinity of the Pribilof Islands during winter, in association with the pack ice. Walrus is another winter resident, and a group of females formerly summered in the Pribilof Islands. If the Bering/Chukchi walrus population continues to increase, females may recolonize the Islands in the near future.

Abundant seabird populations also inhabit the Pribilof Islands. A conservative estimate of approximately 2.8 million seabirds nest on this island complex (Sowls et al. 1978). Colonial nesters utilizing the Pribilofs include about 88 percent of the world population of red-legged kittiwakes (approximately 222,000) and the world's largest colony of thick-billed murres (over 1.5 million) (NOAA 1981, Sowls et al. 1978). Seabirds are generally present in the area from May to October, with the most critical period falling between June and September when the birds are nesting and concentrated around the Islands. Nearby marine waters provide essential feeding habitat. Most foraging occurs within 60 km of the Islands, with highest densities (431 - 530 birds/km^2) occurring within 20 km of the Pribilofs (Bureau of Land Management 1981; NOAA 1981).

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ENCLOSURE 5

Critique of the Draft EIS Impact Assessment for Sale 92

While the draft EIS provides much useful information on environmental and social issues associated with leasing in the North Aleutian Basin (NAB), it is difficult to obtain a complete understanding of the environmental consequences resulting from such actions. Four primary factors are responsible for this difficulty including: (1) the use of a relative index for impact assessment (i.e., major, moderate, minor, and negligible), (2) use of conservative exploration and development scenarios, (3) downplaying potential impacts associated with oil spills due to the projected low probability of occurrence, and (4) the difficulty in accurately evaluating potential impacts due to the large volume of information presented. To reach an informed decision on whether or not to hold the sale, it is critically important that decision makers are fully aware of potential environmental trade-offs associated with oil and gas resource development in the NAB. Consequently, the following discussion elaborates on key problems associated with the draft EIS impact assessment methodology, and outlines some of the potential environmental consequences associated with the proposed lease sale.

The DOI's index of impact assessment is a primary constraint to an accurate portrayal of environmental consequences. The impact index inherently downplays the overall degree of potential environmental consequences by analyzing impacts on regional populations, and discounting effects on local fish and wildlife populations in and adjacent to the NAB. Such an approach does not apply well to the NAB region because local populations often represent an exceedingly important or abundant resource and in some cases are genetically separate stocks. For example, the Naknek and Kvichak River salmon stocks often produce over 50 percent of the sockeye salmon harvested in Bristol Bay, and in 1979 accounted for 70 percent of the total harvest. During the
I-45 adult spawning migration and juvenile out-migration these stocks may be concentrated and very vulnerable to a major oil spill. However, the draft EIS, in discounting aggregate effects on salmon, states that: "Salmon have extensive and widely distributed populations in the Bristol Bay/southeastern Bering Sea area, however; and a reduction in a localized area would not affect the regional population and thus would result in a moderate effect at worst" (page IV-B-6). A similar approach is taken in discussing the potential impacts to the important herring stocks of Port Moller: "Even if a large portion of the herring in the Port Moller area were killed, this would result in only a moderate effect on the regional population because it would affect only a portion of the regional population" (page IV-B-23).

These are but two of many examples in which potential impacts on valuable local (but very large) fish and wildlife populations are downplayed by assessing impacts on a regional basis. Many of these local populations consist of specific stocks that have evolved over thousands of years, and which would not be readily replaced by immigration from regional populations should they experience high mortalities.

The DOI's impact index titles (i.e., major, moderate, minor, and negligible) are also misleading, because they do not accurately portray the described level of impacts. Since the impact index is based upon effects on regional populations, the titles of various impact categories should be reflective of the predicted environmental consequences. For example, the definition of a "major" impact on biological resources is: "A population or species declines in abundance and/or distribution beyond which natural recruitment would not return it to its former level within several generations" (Table S-2). The draft EIS states that a major impact could occur to red king crab if a large spill impacted nearshore areas along the North Aleutian Shelf. Based upon the definition of a "major" impact, this would mean a decline in abundance and/or distribution of the entire southeastern Bering Sea red king crab population for a period exceeding 15 years. Such an impact would be more appropriately described, both in terms of economic and biological effects, as catastrophic rather than "major".

The draft EIS predictions on the level of oil and gas exploration and development activities appear very conservative, and therefore downplay anticipated environmental impacts. The following levels of oil and gas related activities are predicted to result from the proposed alternative: (1) 1,882 miles of seismic surveys, (2) five exploration and five delineation wells, and (3) 20 oil and 12 gas production and service wells. A review of recent offshore development activities shows these predictions to be highly questionable. According to U.S. Geological Survey
I-46 data, over 19,000 miles of seismic lines were shot along the north side of the Alaska Peninsula in 1984 alone. In the adjacent St. George Basin, five exploration wells were drilled in 1984 without any announced commercial discoveries, and over 40 exploration and delineation wells were drilled in the North Sea prior to any oil and gas production. Finally, SOHIO recently announced that approximately 120 wells will be drilled from two artificial islands in the Beaufort Sea to develop the Endicott Field, which we understand to contain oil reserves similar to those estimated for the NAB. If the reservoir characteristics are similar, MMS may have significantly underestimated the number of wells necessary to develop the NAB.

The State is concerned about the DOI's conservative development estimates because they result in low impact predictions for: (1)

conflicts with commercial fishing activities, (2) discharges of drilling muds, cuttings, and formation waters, (3) effects on biological resources, and (4) effects on social and economic systems.

I-47 Another problem with the draft EIS is the practice of downplaying potential oil spill impacts due to their low probability of occurrence. The draft EIS bases its spill predictions on the mean volume of oil and gas expected to be recovered from the NAB. In planning for oil development, it is incumbent upon the DOI to consider the maximum production scenario as the standard by which environmental consequences are evaluated. Based upon the estimated maximum production of 759 million barrels of oil, the draft EIS predicts that approximately two spills greater than 1,000 barrels will occur in the NAB, and that a 14 percent chance exists for a spill greater than 100,000 barrels. These spill projections should be considered conservative because they do not include risks associated with tankers and are partially based on statistics gathered from areas outside of Alaska. These areas pose considerably lower hazards from factors such as earthquakes, tsunamis, or extreme oceanographic and meteorological conditions.

I-48a The NAB draft EIS refers to the St. George Basin final EIS for analysis of earthquake/tsuanami hazards. The St. George Basin EIS charaterizes the North Aleutian sale area as being in close proximity to one of the most active seismic zones in the world. There is a high potential for a large earthquake in the area, and a high possiblity of local tsunami heights of approximately 30 meters. The oilspill risk analysis, since it is largely based on nationwide data, does not take into consideration the relatively greater probability of the proposed sale area to undergo a natural catastrophe which could result in a major spill incident.

Wind direction and speed are key factors in determining spill trajectories and assessing potential nearshore and onshore impacts. The draft EIS states that under influence of prevailing west to southwesterly winds, oil spill trajectories move consistently from the lease area toward the Alaska Peninsula in summer and fall. An unpublished drift bottle study conducted by the Department of Fish and Game in May of 1984, substantiates this prediction. All returns from bottles released in or immediately adjacent to the proposed lease sale area (8 drop points, 750 releases, 48 returns) have been found along the north shore of the Alaska Peninsula, from Izembek Lagoon to Pilot Point. The draft EIS also identified the Port Moller Resource Area as the area most at risk to oil spills with an up-to-99.5 percent chance for oil to contact the nearshore areas within 3 days. Additionally, under maximum production estimates, 1.2 spills exceeding 1,000 barrels in volume are predicted to occur as a result of pipeline transport of oil. In the development scenario, the proposed pipeline from the NAB to a deepwater

tanker terminal is projected to traverse completely across Port Moller and Herendeen Bay, thus further increasing the potential for oil spill impacts in this highly productive area.

Because two or more spills are predicted to occur (under maximum production estimates), and a high probability exists for the Port Moller area to be impacted, it is imperative that the potential consequences of such spills are clearly understood. Assuming the spill occurs within the late spring to early fall period, the draft EIS predicts that the following "major" and "moderate" impacts would occur.

Resource Category	Draft EIS Predicted Impact
King Crab	MAJOR
Commercial Fishing Industry	MAJOR
Marine and Coastal Birds	MODERATE or MAJOR (Major impacts are predicted if oil enters Izembek or Nelson lagoons)
Salmon, Clupeiformes (forage fish including herring and capelin), Groundfish, Crabs and Invertebrates (excluding king crab)	MODERATE
Pinnipeds and sea otters	MODERATE

These predicted environmental consequences are quite serious given the DOI's definitions of "major" and "moderate" impacts (Table S-2). To provide a clearer understanding of what these impacts involve, the following table outlines potential effects, as identified in the Environmental Consequences Section of the draft EIS, for a spill in the Port Moller Resource Area.

Resource Category	Potential Environmental Consequences
King Crab	Serious effects on ovigerous females, developing embryos, pelagic larvae, and benthic juveniles potentially reducing the

	entire southeastern Bering Sea king crab population.
Commercial Fishing Industry	Fouling of fishing gear, closure of fishing grounds, tainting of fish, marketing problems due to public perception, and reductions of portions of regional fish populations. Local salmon and herring fishermen would be most adversely affected due to few alternative sources of income.
Marine and Coastal Birds	High mortality to large shearwater flocks which may approach 2,500 birds/km^2. Major effects to large proportions of several waterfowl species including black brant, emperor geese, Steller's eiders, and Canada geese, as well as substantial numbers of other waterfowl species and shorebirds if oil enters Izembek or Nelson lagoons. Reduced, although substantial, effects to waterfowl and shorebirds outside of lagoons where densities of 65 to 332 birds/km^2 have been observed.
Salmon	Direct mortalities, sublethal effects and a possible delay in spawning migrations, depending on hydrocarbon levels.
Forage Fish (Herring and capelin)	Mortality of adults, juveniles, larvae, and roe depending on timing of oil spill and degree of oil weathering prior to impacting nearshore waters.
Groundfish	Lethal and sublethal effects to eggs or larvae in surficial waters. Currently reduced stocks of pollock, halibut, and yellowfin sole could be particularly vulnerable due to their utilization

	of the NAB and adjacent nearshore waters for spawning and larval development.
Crabs and Invertebrates (excluding king crab)	Lethal and sublethal effects to: planktonic larvae, juvenile, and spawning adult shrimp; all life stages of surf clams; and eggs, larvae, juveniles, and spawning adult crabs.
Pinnipeds and Sea Otters	Displacement of local pinniped populations through contamination of haulout or breeding areas, reduction of benthic food sources for walrus, and a mortality of 400 to 700 sea otters (note: the Alaska Department of Fish and Game believes the DOI's estimate of sea otter mortality is very conservative).

The draft EIS clearly identifies serious environmental impacts associated with an oil spill in the Port Moller Resource Area. The degree of these impacts will vary depending upon the timing, location, and areal extent of a spill; the species and life stages affected; and the degree to which the oil has weathered prior to impacting biological resources. However, the key point is that even under the conservative approach taken by DOI oil spills <u>are</u> predicted to occur and, according to the draft EIS, the highly productive Port Moller Resource Area is the most likely area to be impacted by such spills.

Although the draft EIS is weighted towards impacts associated with large oil spills, it should also be emphasized that there are numerous other concerns regarding oil and gas development activities in the NAB. These concerns center on impacts resulting from the following activities:

1. Habitat alteration from infrastructure development on the Alaska Peninsula and Aleutian Islands;

2. Discharges of drilling fluids and formation waters, which can amount to several hundred thousand tons or several million gallons, respectively, and can result in discharges that would input an equivalent of 110,000 barrels of oil into basin waters as dissolved hydrocarbons;

3. Chronic oil discharges;

4. Disturbance impacts to wildlife populations, particularly marine mammals, nesting marine and coastal birds, and staging waterfowl and shorebirds;

5. Conflicts with the currently established commercial fishing industry;

6. Conflicts with traditional subsistence harvest patterns; and

7. Increased harvest pressure on local fish and wildlife populations.

I-48b On a cumulative basis, these impacts can have very significant consequences. However, the draft EIS generally discounts them as "minor" or "negligible" impacts because they typically affect local, rather than regional, populations. As previously stated, the State disagrees with this approach and believes the cumulative effect of coastal developments and routine operational activities in conjunction with oilspill effects could significantly modify the relative index of impact charaterized in the draft EIS.

Comments on the Commercial Fishing Section of the Sale 92 DEIS Impact Assessment

1. Gear Conflicts (Page IV-B-89)

a. Crab Pot and Long Line Loss

I-49 The DEIS impact analysis appears to under estimate the potential for conflicts between oil and gas activities and fishing gear for the following reasons:

I-50 1) The discussion on gear conflicts is based on the expectation that seismic surveys will occur over a ten year period, from 1985 through 1992. This is an erroneous assumption, and greatly under estimates the period of seismic activity.

The DOI has failed to acknowledge that exploratory seismic surveys in the southeastern Bering Sea actually began in the 1960's and have continued to date. They have also failed to recognize that seismic exploration generally increases just before a sale, and there may be several peaks of seismic activity as successive sales are held in the NAB. Seismic exploration typically continues throughout much of the productive life of a field, as lessees attempt to further define structures and locate the best drilling locations. The DOI has additionally failed to acknowledge that seismic surveys may extend outside of the sale area, into nearshore waters along the Alaska Peninsula, as industry attempts to tie offshore lines into onshore wells where geological stratigraphy is known. The period of seismic exploration in the NAB has already lasted over 20 years, and if a commercial discovery is made it is likely to continue far beyond the 10 years estimated in the DEIS.

I-51a The DEIS also estimates that 1,882 tractline miles of seismic surveys will be conducted in the NAB in conjunction with Sale 92. This is an under estimate of the cumulative number of tractline miles of surveys which will likely be conducted because it does not include pre-sale surveys, and under estimates probable post-sale survey miles. Consequently, the DEIS assessment of potential impacts to commercial harvest activities is probably erroneously low.

United States Geological Survey (USGS) figures indicate that over 66,000 miles of pre-lease sale seismic surveys have already been shot in the NAB. In 1984 alone over 19,000 miles were shot in preparation for Sale 92. The DOI's estimate of 1,882 trackline miles of post-sale surveys is probably also only a fraction of the trackline miles which will actually be surveyed. For example, in 1984 over 3,000 miles of post sale (1983 sale date) tractlines have been surveyed in the St. George Basin.

In several cases where extensive OCS related seismic surveys have occurred in intensively fished areas (e.g., Cook Inlet, Kachemak Bay, Shelikof Strait, Kodiak), buoy and stationary gear loss has been a well publicized problem. For example, there were several instances between 1975 and 1977 where fishermen alleged that seismic and support vessels involved in oil and gas exploration in the original Cook Inlet sale area ran through crab pots in Kachemak Bay cutting off marking buoys. Similar incidents were reported in Kamishak Bay. Tug boats bringing the disabled drilling vessel, George Ferris, into Kachemak Bay in 1975, ran through a large concentration of crab gear at Bluff Point, cutting off many buoys and snagging others on the rig and towlines. There was sufficient concern over conflicts between fishing and support activities that fishermen attempted to get the U.S. Coast Guard to establish
I-51b mandatory traffic lanes in Kachemak Bay and to require support vessels to follow specified corridors to drilling vessels in crab and halibut fishing areas in Kamishak Bay. Fishermen also requested that seismic vessels only operate during daylight hours and employ fishermen observers who could identify and direct seismic vessels around concentrations of stationary fishing gear. The problem subsided as lease operations declined. Reports of these incidents are available in the files of the Homer News and Alaska Department of Fish and Game (ADF&G). Similar incidents were again reported in 1982 when seismic vessels supporting OCS lease operations ran through crab gear in Shelikof Straits. Although the lessee attempted to minimize the problem by hiring observers, at least one additional incident

occurred with the observers on board. Information on these incidents is available from ADF&G and in the files of the Anchorage Daily News.

It should be recognized that crab and halibut gear are usually deployed in the open ocean many miles from land and are often unattended for long periods of time. Unless a fisherman happens to be on site and observes a seismic vessel or towboat cutting off marker buoys it is impossible to document this source of gear loss. Often times a fisherman returns to the location to find that the marker buoys are gone with no clue as to why. Seismic vessels are more likely to be a problem than most vessels because of the long hydrophone streamers which trail behind the vessel (up to 1 mile) and the practice of making repeated passes through an area.

The DOI has not proposed any measures which would mitigate this potential problem other than the advisory information to lessees which encourages lessees to talk to fishermen about mutually satisfactory ways to avoid fishing gear conflicts. Offshore seismic permits are not submitted for either state or local review and comment, so there is no opportunity to alert either the MMS or vessel operators to potential problem areas. The MMS also routinely issues permits for seismic surveys during commercial fishing seasons. For example, the ADF&G received numerous complaints about seismic vessels operating amongst commercial fishing gear and vessels in Shelikof Straits in 1982, in Bristol Bay in 1983, and in Cook Inlet in 1984.

Given the possiblity that 10 to 20 times more tractline miles of seismic surveys will be shot than the draft EIS estimates, and that these surveys will likely occur in areas with
I-52 historically heavy concentrations of fixed gear, it is possible that conflicts between lease activities and fixed fishing gear are likely to be at least a "moderate" problem for a longer period of time than indicated in the draft EIS.

The DOI could reduce or eliminate the problem of gear vessel conflicts by circulating applications
I-53 for seismic surveys to State and local governments for review and comments, and adopting the stipulations which are employed by the State of

Alaska to minimize conflicts with commercial fishing activities. These include:

1.) Restrict seismic surveys to the seasons or periods when commercial fisheries are closed and there is no gear in the water.

2.) If surveys must be conducted during fishing periods, restrict operations to daylight hours and require the use of trained observers to steer seismic vessels around fixed gear.

b. Trawl Gear Damage

I-54 The DEIS also appears to under estimate the amount of damage to trawl gear which may result from oil industry activities in the NAB. Based on information provided by John Goodlad of the Shetland Islands Fisherman's Association at a conference in Sand Point Alaska (April 18 to 20, 1984), there has been considerable damage to trawls in the North Sea as a result of oil industry related debris and obstructions on the sea floor. The Shetland Islands situation is very similar to the North Aleutian Basin for several reasons. First the method used to transport oil ashore from offshore platforms is the same as predicted in the DEIS. That is, unburied seafloor pipelines to a new onshore tanker terminal. Second, the Shetland Islands are also in a remote area, with a small population whose livelihood is based solely on commercial fishing. Third, the main fisheries are trawling for bottom fish, a pot fishery for lobsters, and an inshore fishery for herring and sand lance. The obstructions and debris encountered by Shetland Island's fishermen included pieces of equipment, cable, pipe, anchors, pipelines, wellheads, and holes in the sea floor. Mr. Goodlad estimated that Shetland Island fishermen lost 4.54 million pounds sterling as a result of gear damage and subsequent lost fishing time between 1976 and 1983. Initial damage claims were high (23 in 1975), but declined as fishermen learned to avoid areas with sea floor obstructions. The fishermen claimed that it was difficult to collect damages unless they could recover the obstruction and a company's name was on the debris.

The DOI's proposed Stipulation No. 4, Wellhead and Pipeline Requirements, requires that pipelines be designed or constructed so as not to snag fishing gear. However, no subsea pipelines have been constructed on Alaskan OCS leases and the DOI has not presented any information to date documenting that snag proof pipelines have actually been constructed in OCS waters and that they are, indeed, snag proof. Information from the North Sea, a major trawling and oil and gas development area, indicates that the pipeline constructed in the 1970s still present an obstacle to trawls.

Based on the available information, it is likely that trawl damage from sea floor obstructions will exceed the DEIS estimate of one incident per year. Considering that lease related activities may also place sea floor obstructions in support bases, rig storage areas, and tanker terminals, the potential impacts to fishermen from sale related activities could be "moderate" to "major" in certain locations outside of the sale area even with effective mitigation.

2. Other Effects (Page IV-B-95)

a. Infrastructure and Service-Support Conflicts

If commercially exploitable oil and gas fields are discovered and developed in the NAB, it is possible that there would be "major" rather than "minor" competition between the oil and gas and fishing industries for harbor, dock, and repair facilities in the southeastern Bering Sea. This competition would be more severe if simultaneous commercial discoveries were also made in the St. George, Navarin, or Norton basins. There are several reasons why conflicts would likely be "major."

I-55 First, during the period of oil development in the North Sea the fishing industry in the Shetland Islands (an area with many similarities to the southwestern Bering Sea) and Scotland was apparently impacted by competition with the oil industry during oil development in the North Sea. Fishermen experienced long delays and lost fishing time waiting to get work done on their boats during the period of rapid development. In addition, some fishing ports in Scotland were converted to oil bases thereby displacing fishermen. Second, suitable deep water port sites in close proximity to the lease areas in the Bering Sea appear to be very limited. The only currently suitable deep water harbor with docks, fuel, and an airfield capable of handling jets, for crew changes etc., is Dutch Harbor. Construction of new port facilities for the oil industry may not be a realistic alternative because there may not be any suitable alternative sites available in close proximity to the lease area. Third, the fishing industry is currently depressed, and would probably not be able to compete with the greater resources of the oil and gas industry for limited facilities and services. Fourth, after a discovery is made, field delineation and development will likely be rapid, and probably cannot wait for new port facilities to be developed elsewhere. Finally, Dutch Harbor is the major support base for oil and gas exploration in all four OCS lease areas in the Bering Sea, not just the NAB. If major discoveries are also made in one or more of these areas, competition for marine facilities between the oil and gas and fishing industries will likely be even greater.

Based on the Shetland Island experience and the apparent shortage of alternative facilities and sites in the southwestern Bering, it is possible that competition with the oil industry for services and facilities could have moderate to major impacts on the commercial fishing industry. The magnitude of the impact would likely depend upon the number and size of oil discoveries, and whether or not fisheries were at a high or low cycle.

The DEIS does not offer any measures to reduce negative impacts of competition, however, careful planning by government and industry to identify needed dock space and shore facilities and plan for and facilitate rapid expansion of additional facilities prior to a major discovery would minimize impacts on the fishing industry.

3. <u>Competition for Labor (Page IV-B-96)</u>

Competition for labor between the fishing and oil and gas industries could have a moderate to major effect on the commercial fishing and processing industry, rather than an "insignificant" effect as the DEIS states. If
I-56 a commercial discovery is made, it is possible that the fish processing industry in the southeastern Bering Sea could have a difficult time competing with the higher wages offered by the oil and gas and support industries, during at least the period of exploration and development. Based upon analogous experience in

the Shetland Islands, it is possible that the development of a major oil and gas field would result in a "major" decline (10% by MMS definition) in the labor force for the fish processing industry at least during the period of development.

4. <u>Alteration of Fish Behavior</u>

The draft EIS also fails to evaluate the potential impact of seismic survey induced changes in fish behavior on the commercial salmon and groundfish fisheries. Although, fishermen have long voiced concerns about the disperal of schooling fish by seismic waves, only recently have fisheries managers and industry accepted that this could be a real problem. Department of Fish and Game biologists, while conducting the Bristol Bay Test Fishery in 1983, observed that seismic operations within a few miles of the test fishing vessel appeared to cause salmon to dive to deeper water avoiding nets and reducing expected catches. The Bristol Bay Test Fishery was not however, designed to evaluate the impact of seismic operations on fish behavior. Commercial fishermen at Port Moller in 1983 expressed similar concerns. Representatives of the Cook Inlet Drift Fishermen's
I-57 Association have also complained that seismic surveys conducted in lower Cook Inlet in 1984 caused a decline in salmon catches while seismic vessels were shooting through the fishing grounds. California fishermen have contended for several years that seismic operations disperse large schools of rockfish, and has resulted in lowered harvests for several days following seismic operations. The effect of seismic waves on fish disperal was the subject of a conference in Santa Barbara, California on March 6-8, 1984. As a result of this conference, ARCO in cooperation with local fishermen conducted studies in 1984 to try and quantify the effect of seismic surveys on trawl catches of rockfish in the Santa Barbara Channel. No results are available at this time and it is not clear if salmon, herring and other schooling fish in Alaska waters would behave similarly.

Until definitive information is available on this phenomena, the MMS should evaluate this potential conflict in the DEIS, given: (1) the intensity of commercial fishing activity in and adjacent to the NAB, (2) the fact that the MMS permits seismic surveys during commercial fishing seasons, (3) the level of seismic activity associated with Sale 92 may be several times greater than the DEIS indicates, (4) fishing seasons are short and intense and loss of fishing time or catch can result in considerable economic loss, and (5) disperal or changes in fish behavior can make them unavailable to the commercial fishery. If several seismic surveys were conducted in the vicinity of a local fishery during the fishing season, such as the Port Moller salmon or herring fisheries, it is conceivable that catches and subsequent income could be reduced by more than 10 percent making this a "major" impact under the MMS's definition. The MMS should either sponsor studies to assess this potential problem, or limit seismic surveys to the months when there are no fin fisheries in the survey area.

5. Summary: Cumulative Effects on the Commercial Fishing Industry Page IV B-99

I-58 The DEIS impact analysis may under estimate or not consider certain impacts from oil and gas exploration, development and transportation on commercial fishing and processing in the southeastern Bering Sea. These include:

a. Potential impacts from gear conflicts should be increased from "negligible" to "moderate."

b. Potential impacts from infrastructure, service, and support should be changed from "negligible" and "insignificant" to "moderate" or "major" during the development phase.

c. An additional conflict, seismic alteration of fish behavior, with a potentially "major" level of impact to local fisheries, should be considered in the analysis.

Based on other feasible scenarios, past experience, and analogous case histories, the cumulative effect of oil and gas exploration, development, and transportation on the commercial fishing industry could be "moderate" rather than minor as the MMS has indicated.

Enclosure 7

Page Specific Comments on the North Aleutian Basin Draft EIS

II-D-6, Table II-2, Water Quality. From the North Sea experience, it is expected that production phase water quality impacts would affect an area greater than 1 square kilometer. Further analysis and comments are presented below with regards to the water quality section.

I-59 Figures III-1 to III-11. These figures should have an outline of the proposed sale area mapped onto them.

I-60 III-B-18. The draft EIS identifies a significant data gap with regards to Mysids. The invertebrates have been shown to be extremely important in the nearshore ecology of arctic coastal environments, and it is hypothesized that they have great significance in the ecology of the NAB region. However, their abundance and distribution is poorly known.

I-61 III-D-1 to III-D-2. The Affected Environment section dealing with water quality presents no information on background heavy metal concentrations.

IV.A.5 Estimates of Drilling Effluents during operation.

I-62 The source of these volume estimates is not cited. This information would be a useful addition.

I-63 Table IV-1, second page. No data are presented for the quantity and time interval for disposal of production phase drilling muds. Only the exploration phase is represented.

I-64 IV-A-13. The section dealing with the fate and behavior of spilled oil considers only the fate and behavior of oilspills at sea. The assumed scenario, however, projects a pipeline to the Alaska Peninsula and an oil tanker facility. There is, consequently, a real possibility of a nearshore spill contacting coastline habitats. The "Fate and Behavior of Spilled Oil" section should analyze the eventual fate of spilled oil that contacts low energy, sensitive nearshore habitats, particularly those listed on Page II-C-7. Previous studies indicate that the effects of such spills in analogous areas could last for many years.

Major Actions Affecting the Area (p. IV.A.21.).

I-65 This listing of State Sale Areas should acknowledge the State offshore Bristol Bay Sale is not planned until at least 1994.

I-66 IV-B-5. The assumed drilling fluid dilution rate of 10,000:1 at 100m from the discharge point is based on national statistics from studies sponsored by the petroleum industry, and may overestimate by as much as a factor of five the dilution to be realized in certain areas of the Alaska OCS. To our knowledge there has not been a mud dispersion study for the NAB. However, the mud dispersion study for the Norton Basin (Ecomar 1983) documented dilutions of 2,140:1 at 70m and 7,550:1 at 650 to 690m.

I-67 IV-B-10. The brief duration of discharge alluded to in paragraph 2 applies only to drilling fluid discharge. Produced water disposal would be a continuous, long term discharge from production rigs.

I-68 The dissolved oil concentrations documented 15 kilometers from oil rigs in the North Sea should specify whether this was attributed to a regulated discharge of produced water or occurred after an oil spill at the rig.

I-69 The factual basis for the statement that 100,000 barrel oilspill would spread to cover 200 square kilometers must be referenced. This assumption provides the basis for many of the impact assessments that follow and therefore its derivation is critical. Where did it come from?

I-70 IV-B-12. There is some indication in the first paragraph of what could be the eventual fate of spilled oil: "Hydrocarbons in more fine-grained sediments may persist for 6 to 12 years or longer after a spill." However, in the following section (p. IV-B-13 ff) there are only vague indications of what the actual magnitude of impacts would be in a worse case scenario oilspill. The following are examples:

> The egg and/or larval stages of herring, yellowfin sole, halibut, sablefish, shrimp, and crabs using nearshore areas would be particularly sensitive to hydrocarbon effects. (IV-B-13)
>
> If oil is incorporated into benthic sediments where degradation rates are reduced, there is the potential for long-term contamination of shallow nearshore areas. (IV-B-13)
>
> Major or chronic spill contacting nearshore areas where egg and larval stages of fish and crab species are present could result in a decrease in abundance of one or more species and have possible long-term effects. (IV-B-13)

> Even an oilspill of 100,000 bbls which spread to cover 200 sq. kilometers and resulted in extensive mortalities within that area would affect only a portion of a regional population. (IV-B-15)

The reader is left wondering what would be the actual magnitude of impacts. How large of a portion of populations would be initially killed (50%, 90%)? What estimates are there of how many more individuals would be killed or realize lowered reproductive success or reduced fitness from hydrocarbons that could reside for 6 to 12 years or more?

I-71 IV-B-13 to 16. Subsurface dissolved hydrocarbon concentrations under an oil slick are estimated for the offshore pelagic zone (<1 ppm) but similar estimates are not provided for the nearshore environment. The top of p. 16 states "A massive oilspill which contacted a nearshore area with more shallow waters could result in higher hydrocarbon concentrations and resultant mortalities." What are these estimated concentrations? 5 ppm? 10 ppm? These should be hypothesized and compared to laboratory lethal and sublethal toxicity data to provide for better estimates of potential impacts.

I-72 IV-B-17. Based on estimates of pelagic hydrocarbon concentrations, DEC feels it is a reasonable hypothesis to expect hydrocarbon concentrations high enough to cause lethal effects to some life stages in the shallow waters off Port Moller after a major oilspill.

I-73 IV-B-18. In the Summary section it is stated that, "Diluted discharges of drilling fluids, cuttings, and formation waters from the projected maximum of 42 wells projected over the life of the project could have a minor effect on adult salmon in pelagic areas." However, dilution requirements prior to discharge are not specified in the mitigation section, and the effects analysis does not indicate that these discharges are to be prediluted. In addition, the 42 wells projection is for a mean case scenario and should not be considered as a maximum unless such a limit is placed on the number of wells that may be drilled by stipulation in the mitigation section. The mean case scenario (that effect will be minimal because of only 42 wells) is carried through the draft EIS with other life stages and species, and could result in underestimating environmental effects.

I-74 IV-B-21. The fact that herring embryos exposed to 1 ppm of Prudhoe Bay crude oil has 100% mortality suggests that the 96 hr LC_{50} would be at a much lower concentration.

I-75 IV-B-23, paragraph 2, last sentence. Serious effects on Port Moller herring are dismissed as being "ameliorated within a few years" by recruitment. However, as discussed above, the impacts of a spill in this area could persist for many years (6-12 years or more) and the extremely high sensitivity of herring embryos to crude oil suggests a possible long-term, major impact in this area, particularly if a strong year class was preferentially affected. As with salmon, "moderate" to "major" effects are projected for groundfish (IV-B-28), crab and other invertebrates (IV-B-35), marine birds (IV-B-39), and so on for other groups of organisms, if a major oilspill were to occur, yet the conclusions for each of these groups of organisms is the "Overall. . . effects will be MINOR (or MODERATE)". This "overall. . . effects" determination is based on the reason that a major offshore spill from predetermined launch points would have a low probability of contacting sensitive areas, and would thus only affect a small percentage of the population of given species. Since oilspills do not occur from predetermined offshore locations, this type of analysis and reasoning masks what could be very major and significant impacts.

CITY OF PORT HEIDEN
PORT HEIDEN, ALASKA 99549

RESOLUTION 85-20

WHEREAS, The U.S. Department of Interior has scheduled an oil and gas lease sale in the North Aleutian Basin OCS area; and

WHEREAS, this sale area supports one of the richest concentrations of fish, waterfowl, marine birds and marine mammals in the world; and

WHEREAS, the world's largest run of salmon migrates through the lease area; and

WHEREAS, the Bristol Bay salmon fishery forms the economic backbone of the region and is a resource of state, national and international significance; and

WHEREAS, the villagers are highly dependent on the Bristol Bay salmon fishery as a major source of subsistence food; and

WHEREAS, many questions remain unanswered concerning the potential impact of oil and gas development on the fish and wildlife of the area; and

WHEREAS, the oil industry should gain operation experience in other less sensitive areas before being allowed into the North Aleutian Basin;

NOW THEREFORE BE IT RESOLVED that the City Council of Port Heiden strongly urges the U.S. Department of Interior (Minerals Management Service) to cancel North Aleutian Basin OCS Sale #92 and defer any future sales in the area for at least ten (10) years.

Mayor

Attested by Clerk

THIS RESOLUTION HAS BEEN PROPERLY ADOPTED THIS 5 day of FEB 1985 by the authorized membership of the City Council of Port Heiden, in Port Heiden, Alaska.

OFFICE OF MANAGEMENT & BUDGET
FEB 13 1985
GOVERNMENTAL COORDINATION

CITY OF PORT HEIDEN
PORT HEIDEN, ALASKA 99549

RESOLUTION 85-20

WHEREAS, The U.S. Department of Interior has scheduled an oil and gas lease sale in the North Aleutian Basin OCS area; and

WHEREAS, this sale area supports one of the richest concentrations of fish, waterfowl, marine birds and marine mammals in the world; and

WHEREAS, the world's largest run of salmon migrates through the lease area; and

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WHEREAS, the villagers are highly dependent on the Bristol Bay salmon fishery as a major souce of subsistence food; and

WHEREAS, many questions remain unanswered concerning the potential impact of oil and gas development on the fish and wildlife of the area; and

WHEREAS, the oild industry should gain operation experience in other less sensitive areas before being allowed into the North Aleutian Basin;

NOW THEREFORE BE IT RESOLVED that the City Council of Port Heiden strongly urges the U.S. Department of Interior (Minerals Management Service) to cancel North Aleutian Basin OCS Sale #92 and defer any future sales in the area for at least ten (10) years.

[signature]
Mayor

[signature]
Attested by Clerk

THIS RESOLUTION HAS BEEN PROPERLY ADOPTED THIS 5 day of [illegible] 1985 by the authorized membership of the City Council of Port Heiden, in Port Heiden, Alaska.

THE SEAL OF THE CITY OF PORT HEIDEN

CITY OF PORTAGE CREEK

WHEREAS, The Bristol Bay region of Alaska is internationally recognized for its fish and wildlife resources;

WHEREAS, these resources, particularly salmon, represent one of the very few opportunities the region's residents have for participating in the cash economy;

WHEREAS, further dependence on the abundant fish and wildlife of Bristol Bay comes from the subsistence lifestyle that the vast majority of the region's residents lead;

WHEREAS, the federal Department of Interior is pursuing an outer continental shelf (OCS) lease sale in the North Aleutian Basin (Bristol Bay), scheduled for December of 1985;

WHEREAS, the State of Alaska has recognized, through its own planning process, that there are significant gaps in resource information on the lease sale area, and that industry must demonstrate, in other frontier areas, its capability to explore and produce in an environmentally safe manner;

WHEREAS, the state's recognition of these information needs has resulted in its delaying all lease sales in state waters until 1994, and has called upon the federal government to do likewise with the North Aleutian Basin sale;

NOW THEREFORE BE IT RESOLVED that the City Council of Portage Creek urges the Secretary of Interior to remove North Aleutian Basin Sale #92 from the current OCS leasing schedule until at least 1994.

DRAFT

OFFICE OF MANAGEMENT & BUDGET
FEB 08 1985
GOVERNMENTAL COORDINATION

CITY OF ALEKNAGIK
P.O. Box 33
ALEKNAGIK, ALASKA 99555
(907) 842-5953

OFFICE OF
MANAGEMENT & BUDGET
FEB 20 1985
GOVERNMENTAL
COORDINATION

February 14, 1985

Coastal Resource Service Area
P.O. Box 189
Dillingham, AK 99576

Attn: Tim Hostetler

Dear Tim:

Enclosed is a copy of Resolution 85-5 that the City Council passed on their Regular Council Meeting held February 12th, and the Council supports this resolution and hope that the Federal and State officials involved in delaying the sale of the North Aleutian Basin (Bristol Bay) OCS Lease will consider our support.

Thank you.

Sincerely,

CITY OF ALEKNAGIK

Helen M. Chythlook

Helen M. Chythlook
City Administrator

cc: Rod Swope, Div. of Governmental Coorination
Governor Bill Sheffield
Senator Ted Stevens
Representative Don Young

V-57

CITY OF ALEKNAGIK
P.O. Box 33
ALEKNAGIK, ALASKA 99555
(907) 842-5953

RESOLUTION 85-5

A RESOLUTION DELAYING THE NORTH ALEUTIAN BASIN (BRISTOL BAY) OCS LEASE SALE.

WHEREAS, The Bristol Bay region of Alaska is internationally recognized its fish and wildlife resources;

WHEREAS, these resources, particularly salmon, represent one of the very few opportunities the region's residents have for participating in the cash economy;

WHEREAS, further dependence on the abundant fish and wildlife of Bristol Bay comes from the subsistence lifestyle that the vast majority of the region's residents lead;

WHEREAS, the federal Department of Interior is pursuing an outer continental shelf (OCS) lease sale in the North Aleutian Basin (Bristol Bay), scheduled for December of 1985;

WHEREAS, the State of Alaska has recognized, through its own planning process, that there are significant gaps in resource information on the lease sale area, and that industry must demonstrate, in other frontier areas, its capability to explore and produce in an environmentally safe manner;

WHEREAS, the state's recognition of these information needs has resulted in its delaying all lease sales in state waters until 1994, and has called upon the federal government to do likewise with the North Aleutian Basin sale;

NOW THEREFORE BE IT RESOLVED that the City Council of Aleknagik, Alaska urges the Secretary of Interior to remove North Aleutian Basin Sale #92 from the current OCS leasing schedule until at least 1994.

APPROVED AND ADOPTED THIS 12 DAY OF February, 1985.

Mayor	Vice-Mayor
Secretary-Treasurer	Councilmember
Councilmember	Councilmember

ATTEST: Helen M. Chythlook
City Clerk

2-12-85
Date

EGEGIK VILLAGE COUNCIL
Box 29
Egegik, Alaska 99579

February 4, 1985

Mr. Rod Swope
Office of Management & Budget
Division of Governmental Coordination
Pouch AW
Juneau, Alaska 99811

Subject: North Aleautian Basin (Bristol Bay) OCS Lease Sale

Dear Mr. Swope:

We as a Commercial Fishing community urge you to do all that you can to get the Lease Sale delayed for ten (10) years in order to allow for more time to study the potential environmental impacts and allow the oil companies time to gain experience in other less sensitive areas.

Sincerely yours,

EGEGIK VILLAGE COUNCIL

Richard E. Deigh
President

RED/sk

Enclosure

copies: Honorable Governor Sheffield
Senator Ted Stevens
Representative Don Young
Coastal Resource Service Area Board

EGEGIK VILLAGE COUNCIL
Box 29
Egegik, Alaska 99579

RESOLUTION NO. 85-03

NORTH ALEUTIAN BASIN OCS LEASE SALE #92

WHEREAS, the Village of Egegik is an Alaska Native Village traditionally organized and recognized by the United States thru the Secretary of Interior; and

WHEREAS, the Egegik Village Council is the governing body of the village of Egegik;

WHEREAS, the U.S. Department of Interior has scheduled an oil and gas lease sale in the North Aleautian Basin OCS area; and

WHEREAS, this sale area supports one of the richest concentrations of fish, water-fowl, marine birds and marine mammals in the world; and

WHEREAS, the world's largest run of salmon migrates through the lease area; and

WHEREAS, the Bristol Bay salmon fishery forms the economic backbone of the region and is a resource of state, national and international significance; and

WHEREAS, the Villagers are highly dependent on the Bristol Bay salmon fishery as a major source of subsistence food; and

WHEREAS, many questions remain unanswered concerning the potential impact of oil and gas development on the fish and wildlife in the area; and

WHEREAS, the oil industry should gain operating experience in other less sensitive areas before being allowed into the North Aleutian Basin;

NOW THEREFORE BE IT RESOLVED that the Village Council of EGEGIK strongly urges the U.S. Department of Interior (Minerals Management Service) to cancel North Aleutian Basin OCS Sale #92 and defer any future sales in the area for at least ten (10) years.

Quorum Constituted by 4 members
Voting for 5
Voting against 0
Date Feb. 8, 1985

Certified by Josephine J. Williams
Date 2-8-85

TOGIAK CITY COUNCIL

Resolution No. 85-02

WHEREAS, The Bristol Bay region of Alaska is internationally recognized for its fish and wildlife resources;

WHEREAS, these resources, particularly salmon, represent one of the very few opportunities the region's residents have for participating in the cash economy;

WHEREAS, further dependence on the abundant fish and wildlife of Bristol Bay comes from the subsistance lifestyle that the vast majority of the region's residents lead;

WHEREAS, the federal Department of Interior is pursuing an outer continental shelf (OCS) lease sale in the North Aleutian Basin (Bristol Bay), scheduled for December of 1985;

WHEREAS, the State of Alaska has recognized, through its own planning process, that there are significant gaps in resource information on the lease sale area, and that industry must demonstrate, in other frontier areas, its capability to explore and produce in an environmentally safe manner;

WHEREAS, the state's recognition of these information needs has resulted in its delaying all lease sales in state waters until 1994, and has called upon the federal government to do likewise with the North Aleutian Basin sales;

NOW THEREFORE BE IT RESOLVED that the Togiak City Council of Togiak urges the Secretary of Interior to remove North Aleutian Basin Sale #92 from the current OCS leasing schedule until at least 1994.

Emma Ayojiak-Carlos

Mayor

ATTEST:

Annalee T Schaeffer

OFFICE OF MANAGEMENT & BUDGET
FEB 11 1985
GOVERNMENTAL COORDINATION

Pedro Bay Village Council Resolution #85-01

WHEREAS, The U.S. Department of Interior has scheduled an oil and gas lease sale in the North Aleutian Basin OCS area; and

WHEREAS, this sale area supports one of the richest concentrations of fish, waterfowl, marine birds and marine mamels in the world; and

WHEREAS, the world's largest run of salmon migrates through the lease area; and

WHEREAS, the Bristol Bay salmon fishery forms the economic backbone of the region and is a resource of state, national and international signoficance; and

WHEREAS, the villagers are highly dependent on the Bristol Bay salmon fishery as a major source of subsistence food; and

WHEREAS, many questions remain unanswered concerning the potential impact of oil and gas development on the fish and wildlife of the area; and

WHEREAS, the oil industry should gain operating experience in other less sensitive areas before being allowed into the North Aleutian Basin;

NOW THEREFORE BE IT RESOLVED that the Village Council of Pedro Bay strongly urges the U.S. Department of Interior (Minerals Management Service) to cancel North Aleutian Basin OCS Sale #92 and defer any future sales in the area for at least ten (10) years.

PASSED THIS 14th DAY OF FEBRUARY, 1985.

Council President, Carl Jensen [signature]
Vice-President, Zenia Kolyaha [signature]
Secretary, Ruth Andree ______
Treasurer, Norman Jacko [signature]
Members, Elaine Aaberg [signature]
Keith Jensen [signature]

ATTEST: Barbara Jacko
Village Administrator, Barbara Jacko

OFFICE OF MANAGEMENT & BUDGET
FEB 26 1985
GOVERNMENTAL COORDINATION

Introduction

The State of Alaska's comments on the North Aleutian Basin (Sale 92) DEIS contained general, as well as specific, remarks. The state's concerns were identified in eight enclosures that addressed the following topics: (1) information needs, (2) mitigating measures, (3) fisheries harvest, (4) areas of primary concern, (5) a critique of EIS effects assessment, (6) commercial fishing, (7) specific- page comments, and (8) the Aleutians East CRSA's comments. The Aleutians East CRSA submitted comments to the MMS that were identical to Enclosure 8 of the State of Alaska's letter. As a means of reducing the volume of the FEIS, Enclosure 8 of the state's letter is not duplicated in Section V. The concerns of the Aleutians East CRSA are addressed in the responses to Letter 4.

In addition, the State of Alaska also submitted to the MMS copies of letters from the Natural Resources Defense Council, Inc. (NRDC), the United Fishermen of Alaska (UFA), and the Bristol Bay Coastal Resource Service Area (BBCRSA). Because these groups submitted written comments on the DEIS directly to the MMS, the (duplicate) copies submitted by the state are not included in Section V. Comments submitted by the NRDC, UFA, and BBCRSA are addressed in Responses 29, 6, and 30, respectively.

Response 1-1a

The mitigating measures contained in the EIS, as well as existing laws, regulations, and OCS Orders, provide protection to fish and wildlife resources. The design of the proposed measures is based on the anticipated level of effects on a given resource, the pragmatic capability to provide mitigation if effects are anticipated, and the ability of the MMS to enforce the stipulation. The state's recommendations have been considered fully, and most of the suggested changes to the proposed measures have been made. Responses 1-22 through 1-34 address each of the state's specific recommendations.

Response 1-1b

The EIS does not imply that the capability exists to effectively clean up oil under all open-ocean conditions in the North Aleutian Basin. The EIS is based on the assumption that *if* oil-spill cleanup were effective, environmental effects would *be* mitigated. An evaluation of the effectiveness of oil-spill-response and cleanup operations is included in the EIS (Sec. IV.A.4.e.).

Response 1-1c

The MMS does not agree with the commentor that there are notable deficiencies in the environmental assessment of the proposed action. First, the analysis of effects on environmental resources is not restricted to the planning-area boundaries. The environmental assessment describes and analyzes the resources that could be affected by the proposal, regardless of the geographic boundaries of the lease sale area. Therefore, some resources appear to inhabit a greater area--such as the original Sale 92 area--because of their wide distribution or their migratory behavior. Other resources may be more confined in distribution and, therefore, may correspond more closely to the lease sale area proposed in this EIS.

Second, the MMS feels that the EIS contains adequate information on fish and wildlife species; however, new and recent resource information identified by commentors has been added, where appropriate, to the FEIS.

Third, the MMS acknowledges that there are limitations in the currently available information. The specific concerns included in the state's Enclosure 3 are addressed in Responses 1-35 to 1-43.

Fourth, the resource assessment provided in the EIS is intended to (and does, in fact) cover the resources and habitats that *could* be affected by the proposed action. The MMS appreciates the *resource* overview provided by the commentor, and emphasizes that the EIS discusses these resources in the format and at the level of detail required by the Council on Environmental Quality (CEQ) Regulations, which require greater detail than that represented by the state's overview.

Response 1-1d

The MMS feels that there is sufficient information available to adequately assess the effects of OCS leasing in the North Aleutian Basin, as evidenced by the extensive and thorough treatment given to the analysis of each resource topic in the EIS. This statement does not imply, however, that there is perfect knowledge on these topics. The MMS acknowledges that information is lacking in certain areas, but the total information base is sufficient to perform a responsible assessment of effects from oil and gas leasing in this region. In fact, there probably is more known about the biological resources (particularly fisheries) in this region than in any other region in Alaska. Since 1974, the MMS alone has spent more than $6.4 million on environmental and social and economic research in the North Aleutian Basin. This does not include millions more spent on generic research or studies in other planning areas that could be directly or indirectly applied to the assessment of effects. In addition to these studies, there have been extensive research efforts by the U.S. Fish and Wildlife Service (FWS), the International Pacific Halibut Commission, the Alaska Department of Fish and Game, and the National Science Foundation.

In response to the issue of "information needs," the MMS began consulting with the State of Alaska and the UFA in August 1984.

From this consultation effort, a list of information needs was identified by both groups. The MMS responded by preparing a staff paper that summarized the available information on all of the specific "information needs" pertaining to fisheries that were cited by these two groups. Both the state and the UFA were provided the opportunity to respond and critique the MMS staff paper and provide their own versions. The MMS revised its version and will submit all three versions to the Secretary of the Interior as part of the package of documents used in the decision- making process. This consultation effort resulted in extensive revisions and additions to the FEIS (specific concerns are ad- dressed in Responses 1-2 through 1-21). All points raised by the state and the UFA pertaining to fisheries have been considered in preparing and revising this EIS.

Response 1-1e

The "index" used in the EIS to gauge the magnitude of effects is a yardstick of potential levels of effect with identifiable threshold levels. These levels can be used objectively to determine when the level of the effect is exceeded, thus providing a measurement point for understanding the degree of effect involved. This index covers all ranges of effects, from local to regional, and from small, insignificant ones to catastrophic effects over the full range of possible effect levels. The criteria used in this index are established to aid the Secretary and others in understanding the degree of effect involved in each effects class. It should be recognized that local population effects are still local. The analysis in the EIS does not deny them; in fact it recognizes them. It also recognizes the regional effects. Both are frequently necessary to describe the total effects, and the EIS gives both. The Secretary thereby has the complete picture for his decision.

The decision to proceed or not to proceed on leasing OCS areas for exploration and potential development is not a site-specific decision, like that which occurs with approval/disapproval of development plans. It cannot be site-specific because of the nature of the uncertainties involved before exploration is even attempted. To make this decision adequately, it is only necessary to know broad and large-scale effects at this point. It is simply impossible to get "site-specific" or locality specific with this decision at this stage of planning. Only in later stages of planning, after leasing, can this level of decisionmaking be done.

The analysis of effects on a broad regional basis is appropriate at the level of information known at this stage because it is directly related to the broad nature of the decision itself. That decision is a what-to-do-type decision. The nature of it is go, cancel, delay, or go in a smaller subregional area.

The definitions of effect level used in these analyses are, therefore, directly and closely related to the broad nature of the decision that the Secretary of the Interior faces. The decisionmaker needs to know whether broad regional and population-wide effects are associated with his choice. The method of analysis provides him this information. Also, where it is possible to do so, the EIS provides recognition of the fact that, despite broad regional consequences of any degree, there can be localized effects on small parts of a population in a particular locality.

Critics may disagree with this approach, but the MMS believes that no other realistic analysis approach is possible until oil has been found and locality-specific planning is thus made possible. It is this two-tiered analytical recognition of environmental effects that shows clear recognition of both classes of effects (regional and local) that are possible from the decision to proceed with a lease. Far from being a portrayal of effect that "downplays" the potential consequences, it presents a fuller and more complete picture of the range of effects that is potentially involved.

Response 1-1f

Considering the limited number of prospects and the low resource estimates that have been identified in the proposed lease sale area, the MMS feels that the projected level of activity is appropriate.

Response 1-1g

The spill projections used in the EIS are the best available, and the MMS has confidence in their accuracy. The MMS uses the mean-case resource in oil-and-gas-lease-sale EIS's. The mean case is much more likely to occur than the maximum case. See also Response 4-3. Other concerns identified in this issue are addressed in Responses 1-48a, 4-3, 4-7, 4-14, 4-15, 4-16, 4-68, 4-69, 6-112, 6-113, 6-114, and 29-10.

Response 1-1h

This concern is addressed in Response 1-1e.

Response 1-1i

The concerns regarding the analysis of effects on the commercial fishing industry are addressed in Responses 1-49 through 1-58.

Response 1-1j

Drilling muds and cuttings are not expected to be a significant problem during the production phase. During the exploration phase, 3,500 to 7,000 tons of drilling muds and 10,500 to 15,500 tons of cuttings would be discharged as a result of drilling operations. As noted by this comment, these discharges would be minimized through the issuance of National Pollutant Discharge Elimination System (NPDES) permits by the Environmental Protection Agency (EPA). The EPA does not consider exploration discharges to be a significant problem (see Letter 15). Between 1990 and 1993, production-well-derived mud solids could be about 1,344 tons, while the amount of drill cuttings could range between 38,400 and 54,400 tons. The quantities of production-derived muds and cuttings are of the same orders of magnitude as exploration discharges, which are not considered to present a problem. This EIS evaluates the effects of both exploration and production discharges on water quality in Section IV and concludes that effects would be minor. The discharge on muds and cuttings also would be regulated through NPDES permits.

Response 1-2

Although no studies have addressed the possible direct uptake of hydrocarbons by red king crab eggs, in Section IV.B.1.a.(1) the EIS acknowledges that developing eggs are at risk to hydrocarbon exposure because they are externally brooded for 11 months. In the absence of more specific information on this topic, the EIS takes a conservative approach by assuming contact of hydrocarbons and eggs and consequent mortality, which tends to overestimate the likely effects.

Although more specific information on the onshore-offshore migration of females would enable a more refined analysis, the EIS also conservatively assumes contact of oil and ovigerous females in the more shallow waters (70 m or less) occupied during the summer and assesses potential effects of such contact. This also tends to overestimate the effects.

Available information on the effects of hydrocarbons on chemoreception and potential disruption of reproductive behavior in crabs has been summarized in the generic effects and incorporated in the analysis of effects on red king crab. Although current information on oil effects on chemoreception is not specific to red king crab, the analysis assumes similar effects that would result in the disruption of mating.

Response 1-3

Available information on larval distribution and abundance is summarized in Section III.B.1.a.(1) and incorporated in the analysis of potential effects on red king crab in the site-specific analysis. In the absence of more specific information on larval distribution and subsequent transport, the analysis assumes contact of larvae and hydrocarbons and subsequent mortality for purposes of analysis.

The EIS (Sec. IV.B.1.a.(1)) also acknowledges the importance of protective rearing habitat to juvenile red king crabs. Although specific areas of the rocky-cobble habitat have not been identified in the areas adjacent to the North Aleutian Basin lease sale area, sufficient protective habitat exists to historically support the Bering Sea red king crab population. Considering the great (historical) abundance of this resource, it can be argued that an expansive habitat for rearing exists in this region. For purposes of analysis, the EIS assumes mortality of both larvae and juveniles that are concentrated in nearshore areas, and assesses the consequent effects on recruitment, which--in combination with adult and egg mortality--may result in a major effect on the regional population of red king crab.

Response 1-4

Current available information shows that juvenile red king crab live and feed primarily in shell/hash/rocky-cobble areas that are relatively high-energy environments in which spilled oil would not be likely to accumulate. It is not expected that oil would accumulate and persist long enough in these areas to affect the settling and recruitment of food organisms for juvenile crabs. Because this has not been specifically demonstrated, however, the analysis in the EIS (Section IV.B.1.a.(1)) assumes conservatively that a major oil spill could occur and result in a reduction of preferred prey, and affect growth and survival within the affected localized area.

Response 1-5

Available information on the migration patterns and timing of Pacific salmon in the Bristol Bay region is summarized in Section III.B.1. and incorporated in the analysis of effects on salmonids in Section IV. The analysis of effects on juvenile salmon is based on the conservative assumption that an oil spill would contact the nearshore when juveniles are present in large numbers and densities. Further, it is assumed that these juveniles would not avoid contaminated areas, but would be killed upon contact with dissolved oil in the water column, regardless of concentration. Based on these assumptions, the analysis overestimates the potential effects on regional salmon populations.

To state that juvenile salmon of all species become mixed in outer Bristol Bay does not mean that all of the Bristol Bay stocks come together in a relatively small area. These stocks are likely to be mixing over vast expanses of ocean area. Thus, the assertion in the EIS is valid; only a relatively small number of fish could be affected by an oil spill.

Response 1-6

The EIS (Sec. IV.B.1.a.(1)) concludes that no avoidance or delay of migrating adult salmon is likely to occur because concentrations of dissolved hydrocarbons at levels at which adult salmon have demonstrated avoidance behavior would not be expected from an offshore oil spill. A nearshore pipeline spill in the vicinity of Port Moller could produce higher concentrations of hydrocarbons near the mouths of spawning streams around Herendeen Bay. However, these concentrations would diminish within a limited time period (10 days). Concentrations of dissolved hydrocarbons still would not approach the demonstrated avoidance threshold.

Response 1-7

Seismic surveys associated with this lease sale would be well away (a minimum of 9 miles) from areas of commercial salmon fishing and would have no effect on the harvesting. The vast majority of the salmon fishery is within 3 miles of the coastline.

Response 1-8

Information on the distribution of spawning adult herring and the distribution of larval herring is summarized in Section III.B.1. and incorporated in the analysis of effects of oil on herring. In the absence of more specific information, the analysis again assumes a conservative approach and assumes that these vulnerable lifestages are concentrated in nearshore areas that are contacted by oil and experience mortality upon contact by hydrocarbons. The analysis acknowledges that such contact and mortality could seriously affect a local stock (i.e., Port Moller).

Information on the distribution and abundance of adults in offshore areas and their migration routes to and from spawning areas is presented in Section III.B.1. and incorporated in the analysis (Sec. IV.B.1.a.(1)). Contact of offshore herring and hydrocarbons also is assumed in assessing the potential for oil-spill effects on the regional herring population.

Response 1-9

Information on spawning substrates (*Fucus*, *Zostera*) used by herring, the effects of oil contamination on these substrates, and the potential effect on herring spawning are analyzed in the EIS (Sec. IV.B.1.a.(1)). An oil spill that contacts *Fucus* or *Zostera* may result in (1) increased exposure to hydrocarbons, which causes additional mortalities and sublethal effects on the various lifestages of herring, and (2) reduced reproductive success over a number of years through elimination of spawning habitat.

Response 1-10

Information on adult distribution and abundance, nearshore spawning, and larval distribution and migration would enhance the assessment on capelin presented in Section IV.B.1.a.(1) of the EIS.

However, surveys show that capelin are abundant and widely distributed throughout this region. As such, even a major oil spill could affect only a small segment of the total regional population, even if one conservatively assumes that the oil spill contacted a capelin spawning area during spawning season and that all capelin contacted were killed.

Response 1-11

Although long-term effects of hydrocarbons on capelin spawning habitat, specifically, have not been documented, the analysis conservatively concludes that oil that contacts the coarse-grained sediments preferred for capelin spawning would percolate into the sediments, remain in those sediments over several years, and consequently expose spawning capelin to oil effects over a period of years. The analysis (Sec. IV.B.1.a.(1)) assumes contact of spawning capelin and eggs with oil and resultant mortality in assessing the potential oil-spill effects on the regional population of capelin.

Response 1-12

In the absence of specific information on the effects of hydrocarbons on adult, egg, larval, and juvenile lifestages of capelin, the analysis (Sec. IV.B.1.a.(1)) conservatively assumes (1) hydrocarbons contact these lifestages while they are concentrated in nearshore areas, (2) contact results in mortality, and (3) contamination of spawning substrates results in persistence and long-term exposure of spawning capelin to hydrocarbon effects. The assumptions are used in assessing the potential effects of hydrocarbons on the regional population of capelin, which spawns adjacent to the lease sale area.

Response 1-13

Available information on the distribution of adult Pacific sand lance from the ongoing NOAA/OCSEAP 1984 study is summarized in Section III.B.1. and incorporated in the analysis of the FEIS (Sec. IV.B.1.a.(1)). In the absence of more specific information on the distribution and abundance of adult, larval, and juvenile sand lance, the analysis again conservatively assumes that these lifestages are contacted by hydrocarbons, which results in mortality.

Response 1-14

Because sand lance, like capelin, use sand and gravel substrates for spawning, this concern is addressed in Response 1-11.

Response 1-15

In the absence of specific information on the effects of hydrocarbons on adult, egg, larval, and juvenile lifestages of sand lance, the analysis conservatively assumes that (1) hydrocarbons contact these lifestages while they are concentrated in nearshore areas, (2) contact results in mortality, and (3) contamination of spawning substrates results in persistence and long-term exposure of spawning capelin to hydrocarbon effects. These assumptions are used in assessing the potential effects of hydrocarbons on the regional population of capelin, which spawns adjacent to the lease sale area.

Response 1-16

The MMS is aware of the limited availability of quantitative information concerning the disturbance of waterfowl by aircraft, and of the specific problem of brant disturbance by helicopter overflights (approximately 35/week) of Izembek Lagoon this past fall (1984). This latter problem was partially solved through agreement (between refuge personnel and the lessee's flight-service subcontractors) of pilots to fly around the southern edge of the lagoon when weather conditions were VFR (visual flight rules), thereby avoiding the most heavily used brant-foraging areas. Such an agreement essentially is similar to recommendations for avoiding wildlife made by the MMS in the proposed Information to Lessees (ITL) on Bird and Marine Mammal Protection; that is, for aircraft to maintain at least a 1-mile horizontal distance from bird and mammal concentrations or known concentration areas. Such mitigation would alleviate the brant/ helicopter problem, especially if the emphasis were placed on avoiding areas of concentration rather than on avoiding bird concentrations.

Under IFR (instrument flight rules) conditions, all aircraft must use the IFR flight path across the northern part of the lagoon. This is not likely to be modified by the Federal Aviation Administration (FAA) in the foreseeable future, nor are further studies likely to suggest a feasible complete solution to this aspect of the problem. Fortuitously, this corridor transverses an area of less intensive use by brant, so significant disturbance of the population probably would not occur.

Specific information resulting from observations made during the fall migratory period at Izembek Lagoon is incorporated in the current analysis (Sec. IV.B.1.a.(2) of the FEIS) and represents the best information available at present.

Substantial avoidance of major disturbance to these populations could decrease the need for intensive studies of long-term effects; however, in view of the current decline in several goose populations and the potential increases in air traffic, if offshore

development accelerated, the need for this information would continue to exist. Information pertinent to this problem may be forthcoming from waterfowl studies under consideration by the FWS.

Brant, the most sensitive of the species staging in Izembek Lagoon, may be displaced from foraging areas by rotary-wing aircraft operating within about a 3-mile horizontal distance and apparently at almost any altitude. While the physiological effects of this disturbance are little known, the apparent lack of specific information is not considered so important or essential that the Secretary must obtain that information before deciding among alternatives for the lease sale, particularly because appropriate mitigating efforts can be made. This includes routing VFR air traffic south of the lagoon, thereby removing the disturbance to several miles from brant concentrations. This was tested, in effect, by last fall's agreement between flight-service subcontractors and refuge personnel, and found by the latter to result in acceptable levels of disturbance. Currently, little mitigation can be accomplished with respect to use of the IFR corridor over the northern part of the lagoon, but fewer geese use this area. Problems related to helicopter-flight altitudes appear incapable of complete resolution at present, because it is not feasible for these aircraft to maintain sufficient altitude to prevent disturbance of the brant. These disturbance situations can be dealt with through mitigation, rather than as situations that must remain static until new information is available. Accordingly, the MMS finds that, under the CEQ Regulations, a formal "worst-case" analysis is not warranted. Nevertheless, the EIS candidly admits that possible effects on the brant may range from moderate to major.

Response 1-17

The MMS recognizes the desirability of obtaining additional information concerning the distribution and abundance of marine birds in the North Aleutian Basin, especially during the winter season. However, Arneson (1980) provides information on winter bird densities in this area which, together with oil-spill-trajectory and risk information, allows credible conclusions to be drawn (Sec. IV.B.1.a.(2)). The MMS's North Aleutian Basin studies presently underway provide additional information on the distribution and abundance of birds in this area in all seasons. The greatest bird concentrations are likely to occur in nearshore waters and lagoons, especially in minimal ice years, in the opposite direction from hypothetical trajectories of spills originating in the lease sale area in winter. Thus, with the relatively low risk of oil-spill occurrence and contact projected (less than 10%), it does not appear that the current data base for winter would prevent an adequate analysis of risk during that season.

Response 1-18

There is information available to assess the potential effects of oil and gas exploration activities on the gray whale in the vicinity of the lease sale area (Sec. IV.B.1.a.(4) and Jones et al., 1984). In areas where information is lacking but may be necessary for making a reasoned choice among alternatives, a worst-case analysis has been prepared (Sec. IV.J.) The Secretary of the Interior has at his option an alternative to delay or delete the sale from the current schedule if he determines that not enough information is available for his decision. The Secretary will make the final decision as to whether additional information is needed to adequately assess the potential effects of oil and gas activities on the eastern Pacific gray whale population.

Response 1-19

Adequate information on the abundance and distribution of sea otters along the northern side of the Alaska Peninsula and Unimak Island is available to assess the potential effects of oil and gas activities (Sec. IV.B.1.a.(3)). The information on relative abundance and distribution of sea otters (Schneider, 1976) identified sea otter-concentration areas that would be affected if an oil spill occurred. An estimated 400 to 700 sea otters would be killed, based on an oil spill spreading in an area of high sea otter density.

The study by Cimberg et al. (1984) reported comparable data on the location of habitats of high and moderate sea otter densities. Cimberg et al. (1984) reported seasonal changes in the Port Moller area, with lower abundance during late winter (March) and early summer (June), and with high densities during August and October. The high sea otter-density index of 6.5 individuals/1 km^2 (Schneider, 1976) was used to estimate the number of sea otters that may be affected by an oil spill. Cimberg et al. did not provide a relative-density index for habitat areas of "high, mid, and low abundance," as did Schneider (1976); but they reported a similar estimate of the total population in the lease area of 15,000 to 20,000, while Schneider (1976) estimated the population at over 17,000. If sea otters seasonally migrate through False Pass, as Cimberg et al. suggest, the local loss of an estimated 700 sea otters over a 100-km^2 area (such as in a high-abundance area) may represent a minor effect on the regional population rather than the moderate effect estimated in the EIS, because recruitment of additional sea otters from the southern side of the Alaska Peninsula could replace lost individuals within less than one generation. The EIS conservatively estimates the potential effect to be moderate in consideration of the uncertainties of the population recovery after an oil spill.

Response 1-20

The text has been amended to include a discussion of documented effects of hydrocarbon contamination on eelgrass (Zostera marina) (Sec. IV.B.1.a.(1) of the FEIS). Productivity of eelgrass may be reduced by exposure to hydrocarbons, and recovery of eelgrass after disruption is slow because it involves ecosystem development.

Response 1-21

Further discussion of oil-spill-response capability in the open ocean has been added to Section IV.A.4. of the EIS.

Response 1-22

Stipulation No. 1 (Protection of Cultural Resources) has not been amended. Stipulations included in the EIS generally apply to the OCS and the leasehold--the area over which the MMS has jurisdiction and enforcement authority. The archeological and historical sites delineated by the Aleutians East CRSA draft Coastal Zone Management (CZM) Plan are located on the Alaska Peninsula and are subject to the control of state and local authorities. Because the cultural-resource stipulation applies only to the leasehold and the OCS, the recommended language was not added to the stipulation.

In response to this concern, the ITL on Coastal Zone Management has been revised to include the following: "Lessees are advised that the draft Aleutians East Coastal Resource Service Area Coastal Zone Management Plan delineates archeological and historical sites."

Response 1-23

Stipulation No. 2 (Orientation Program) has been amended. The following language has been added to the stipulation: "The program also shall include presentations and information about all pertinent lease-sale stipulations and ITL provisions, and about stipulations applied to subsequent exploration plans, and development and production plans.

Response 1-24

A stipulation is a contractual agreement between the lessee and the lessor that sets forth the requirements of lessees. Policy statements concerning the MMS's behavior and conduct in administering the stipulation should not be part of this contractual agreement. For this reason, the recommended language was not adopted. The FEIS does include an ITL for consultation with the Bering Sea Biological Task Force (BTF) for the protection of biological resources.

Response 1-25

The state and local Coastal Resource Service Areas (CRSA's) have the opportunity to review exploration plans, development and production plans, and pipeline right-of-way applications for consistency with mandatory enforcement policies in the Alaska Coastal Management Program pursuant to Section 307(c)(3)(B) of the Coastal Zone Management Act (CZMA). Because the CZMA provides the state and the Aleutians East CRSA with the authority to review industry plans through the consistency-review process, the MMS feels that it is inappropriate to include a statement in the stipulation indicating that the Regional Supervisor, Field Operations (RSFO), should consult with the Aleutians East CRSA regarding any proposed pipelines. The ITL on Coastal Zone Management advises the lessees of the Alaska Coastal Management Program and the consistency-review process.

Response 1-26

This concern is addressed in Response 1-25.

Response 1-27

The language in the ITL on Coastal Zone Management has been changed as follows:

(1) In the first sentence, the word "may" has been deleted and the word "contains" has been added.

(2) The following statement has been added at the end of the first paragraph: "Lessees are advised that the draft Aleutians East Coastal Resource Service Area Coastal Zone Management Plan delineates archeological and historical sites."

(3) The following language has been added at the end of the ITL: "The State of Alaska has advised the MMS that it will review the lessee's consistency certification accompanying oil-spill-contingency plans specifically for consistency with the State's CMP. The State may not concur with the lessee's plans for exploration, development, and production under Section 307(c)(3) of the Coastal Zone Management Act unless they are adequate to ensure consistency with applicable policies in the State's program. The State's review will consider the best available and safest technologies for operating in the North Aleutian environment. Also considered in this are the lessee's contingency plans in the event of an oil-well blowout (including relief-well plans), and the lessee's ability to initiate timely oil-spill-recovery operations, as required by Federal or State regulations to protect areas of special biological sensitivity."

The ITL also has been amended to notify lessees of the Bristol Bay Plan for State Lands.

Response 1-28

The ITL on Areas of Special Biological Sensitivity has been amended to include Amak Island and Sea Lion Rocks as Areas of Special Biological Sensitivity. State designations for the Walrus Islands and Cape Newenham have been corrected in the ITL.

Response 1-29

The ITL on Areas of Special Biological Sensitivity has been modified to include the following statement: "Due to the sensitivity and vulnerability of these areas to spilled oil, special attention will be given to deployment plans and time requirements on the review of oil-spill-contingency plans. Such protection should not include dispersant usage unless such usage has been approved in advance."

Response 1-30

The following language has been added to the ITL on the Bering Sea Biological Task Force: "Before making recommendations to the RSFO, the Bering Sea BTF should consult with representatives of the State of Alaska and local communities that can contribute to biological evaluations."

Response 1-31

The Federal Aviation Administration--not the Minerals Management Service--has the authority to establish flight corridors. Therefore, the ITL on Bird and Marine Mammal Protection has been revised to indicate that ". . . unless more restrictive distance or routing requirements have been specified by the RSFO, or other resource agencies, it is recommended that aircraft and vessels operated by lessees or their contractors maintain at least a 1-mile horizontal distance from known or observed wildlife concentrations."

The ITL on Areas of Special Biological Sensitivity has been amended to include Moffett Lagoon, Big Lagoon, Hook Bay, St. Catherine's Cove, and Swanson Lagoon. The MMS feels that it is inappropriate to include the aircraft policies of the draft Aleutians East CRSA Coastal Management Program in the ITL.

The State of Alaska and local CRSA's have the opportunity to review exploration plans, development and production plans, and pipeline right-of-way applications for consistency with the mandatory enforceable policies of the state Coastal Management Program pursuant to Section 307(c)(3)(B) of the Coastal Zone Management Act. The ITL on Coastal Zone Management advises the lessees of the Alaska Coastal Management Program and the consistency-review process.

Response 1-32

The stipulation presented in the Navarin Basin Notice of Sale was designed to protect bowhead whales from oil spills, and is based on industry's limited ability to demonstrate adequate cleanup capabilities within the marginal front and pack-ice zones. Since these ice conditions do not occur in the Sale 92 area when endangered whales are present, and because bowhead whales are far less common in the North Aleutian Basin, such a stipulation is not necessary. The NMFS biological opinion did not recommend any such stipulation as a reasonable and prudent alternative to protect the gray and right whale from likely jeopardy.

Response 1-33

The present ITL, in conjunction with the Oil/Fisheries Group of Alaska, more than adequately addresses the potential for gear conflicts. There is no reason to supplement a successful protective measure. The ITL and the Oil/Fisheries Group of Alaska provide the lessees with information on important commercial fishing areas and periods.

Review of proposed seismic surveys in federal waters by State and local governments imposes additional procedures on activities essentially outside the jurisdiction of these levels of government. The MMS believes that the industries are best equipped and able to prevent and/or resolve conflicts should they arise without government interference. Should this fail, then additional regulation may be required.

Given the short term of fixed-gear fisheries now operative in the federal waters off Alaska, seismic surveys usually are performed during closed fishing periods/seasons.

The MMS believes that restricting seismic surveys to daytime operation during fishing periods, using a trained observer, is unnecessary insofar that it is in the best interests of the geophysical operator to avoid entangling fixed gear with valuable seismic instrumentation.

Based on the existing information on the North Aleutian Basin and the analysis of effects for this EIS, there is no evidence that seismic activities need to be restricted. Neither the National Marine Fisheries Service nor the Fish and Wildlife Service requested a seismic-survey restriction for this sale. However, if populations and/or habitats of commercial fisheries should require additional protection because of their sensitivity or vulnerability

to any lease operations, Stipulation No. 3 (Protection of Biological Resources) provides that the Regional Supervisor, Field Operations (RSFO), may require lessees to conduct a biological survey to determine the extent and composition of biological populations or habitats. Based on these surveys, the RSFO may require the lessee to: "(3) operate during those periods of time, as established by the RSFO, that do not adversely affect the biological resource." Also, the ITL on the Bering Sea BTF states that the RSFO will consult with the BTF on the conduct of biological surveys and an appropriate course of action after surveys have been conducted.

Response 1-34

An ITL on Oil-Spill-Contingency Plans has been added to the FEIS. The proposed ITL is similar to the ITL's found in the Notices of Sale for Norton Sound (Sale 57), Navarin Basin (Sale 83), and St. George Basin (Sales 70 and 89).

Response 1-35

The text has been amended to reflect this concern (see Sec. III.B.2.).

Response 1-36

The text has been amended to reflect this concern (see Sec. IV.B.1.a.(4)).

Response 1-37

The text has been amended (Sec. III.C.1.c.(1)) to incorporate additional information on potential commercial fisheries for capelin. Development of a capelin fishery, however, may be dependent on a decline in the Bering Sea herring fisheries, a species of greater economic value. The Atlantic Ocean and Bering Sea capelin fisheries are operative due, in part, to lesser or nonexistent fisheries for herring.

Response 1-38

The importance of the southeastern Bering Sea as rearing habitat for juvenile Pacific halibut is acknowledged in Section III.B.1. Halibut is one of the groundfish species identified in the analysis of environmental consequences (Sec. IV.B.1.a.(1)) as having the potential to be more seriously affected by a major oil spill that contacts the species than other groundfish species whose stocks have not experienced declines.

Response 1-39

According to the International Pacific Halibut Commission (D. McCaughran, personal communication, March 1985), the Bering Sea halibut populations are "increasing slightly since reduction in the incidental catch." This incidental catch was made largely by foreign vessels trawling for other groundfish.

In 1983, the harvest limit for Halibut Regulatory Area 4A, which encompasses virtually all of the proposed lease sale area and also large segments of the Bering Sea and Gulf of Alaska, was 544 metric tons (1,200,000 lbs) (Pacific Halibut Fishery Regulations, 1983). The text has been amended (Sec. III.B.1.) to indicate that Bering Sea halibut populations are of sufficient size to support a commercial fishery.

Response 1-40

The Aleutian tern colony in Port Moller, containing approximately 1,000 individuals, represents 10 to 15 percent of the current population estimated to number 6,500 to 10,000 (Sowls et al., 1978), rather than 50 percent, as suggested in comments received from the State of Alaska. This colony is clearly indicated on Graphic 2, noted in the text revision of Section III.B.2. (Marine and Coastal Birds), and discussed in Section IV.B.1.a.(2) (Effects on Marine and Coastal Birds).

Response 1-41

The EIS does not "fail to acknowledge the limitations of available data," but candidly notes that fact, where appropriate. The description of the red king crab resources of the North Aleutian Basin (Sec. III.B.1.) summarizes the available life-history information on red king crab, but does not intend to suggest that the nearshore population dynamics ~~of this~~ species are completely defined in the area. Because the distribution, abundance, and population dynamics of red king crab are not specifically documented shoreward of the 50- to 60-meter isobath, the analysis of environmental consequences took a conservative approach, assuming that all lifestages of red king crab would be concentrated in the nearshore area and would be contacted by a 100,000-barrel oil spill (see Sec. IV.B.1.a.(1)).

Response 1-42

As stated in the text, "Whales migrating through the St. George Basin pass in a broad front across the shelf from Nunivak Island to Unimak Pass." indicates that the southbound migration is less coastal and more diffuse than the spring migration.

Response 1-43

The description of the seaward migration of the five species of Pacific salmon does not intend to give the impression that extensive research has been conducted on this topic, or that the seaward

migration routes of all five species have been established. Section III.B.1. summarizes the available information by species. To emphasize that this description does not mean to imply that the migration routes are known in detail for all five species, the following statement has been added to the text: ". . . only sockeye salmon have been studied sufficiently to describe in some detail their seaward migration (Thorsteinson, 1984)."

Because it is the most current, thorough source of life-history information for Pacific salmon in the area, the North Aleutian Basin synthesis report (Thorsteinson, 1984) was used and cited frequently. This is not meant to suggest that Thorsteinson presented original research on salmon life history, but merely reflects that this source is valuable as a synthesis of information gathered by experts--including Straty, who did most of the research on salmon-migration routes.

The MMS believes that the limited detail on salmon outmigration does not limit the ability to conduct a responsible assessment of environmental effects, as the state suggests. Because information on all salmon-outmigration routes is not known in detail, the analysis represented a conservative approach to assessing potential effects by assuming that fry or juveniles were in nearshore areas and were contacted for several days by a major spill that resulted in high hydrocarbon concentrations and consequent mortalities. Paragraph 8 of Section IV.B.1.a(1)(b) of the FEIS gives more detail on these assumptions and potential effects.

Response 1-44

The EIS does highlight areas of primary concern in relation to the lease sale area. If a specific region (i.e., Bering Sea coastal habitats, Unimak Pass) is an important habitat for a particular fish or wildlife species, it is identified in the appropriate section.

Response 1-45

This concern is addressed in Response 1-1e.

Response 1-46

It is typical for large numbers of seismic surveys to be shot in the year preceding a sale. Large numbers of seismic surveys are necessary to define all possible prospects in a basin. Once the overall basin has been defined, certain areas can be chosen for further definition. Some sale areas may contain only a relatively small area of prospect interest. This situation would result in fewer projected seismic surveys being required.

The resource evaluation office uses the most recent geologic-structure information to predict the number of exploration wells. The proven reserves for the North Sea are over 20 billion barrels of oil; the mean-case resource for the North Aleutian Basin is less than 500 million barrels. A comparison of the North Sea exploratory situation and the North Aleutian Basin would be invalid.

The Endicott comparison is addressed in Response 8-23.

Response 1-47

The EIS does not downplay potential oil-spill effects because of the low probability of occurrence. The analysis of oil-spill effects assumes that only 1 spill of 1,000 barrels or greater will occur over the 26-year life of the proposed oil development. The analysis also assumes that the spill will contact the various resources of concern at their most sensitive and vulnerable time and location. Conclusions are based on information about oil-spill fate and behavior, the sensitivity of the oil to the resource, and the distribution of the resource. Information is then provided concerning the probability of occurrence. Obviously, with 1 oil spill projected over the life of the proposal, the information about probability has been factored into the analysis. Those resources and habitats that show an insignificant probability of contact by a spill would not be expected to be affected in the analysis.

The maximum case (759 MMbbls) is not used for the analysis of the proposed action because the mean-resource projection is more likely to occur. The maximum case is, however, analyzed in Appendix A.

An analysis of an offshore-loading scenario that considers the risks associated with tankers has been added to the FEIS (Sec. IV.B.2.).

Response 1-48a

The California OCS, Cook Inlet, and the Port of Valdez also are areas in close proximity to two of the other most active seismic zones in the world. Offshore-California-spill statistics are included in the calculation of OCS spill rates. State leases in Cook Inlet and tankering of state oil from Valdez have spill rates statistically similar to those calculated from OCS data (see Sec. IV.A.3.b.). No OCS, Cook Inlet, or Valdez tanker spills have resulted from earthquakes or tsunamis. Tsunami heights at sea are negligible--only when a tsunami nears shoreline would its height possibly increase to 30 meters. Thus, tsunamis would pose a risk to shore facilities but not to at-sea pipelines, tankers, or platforms. Furthermore, the tsunami hazard cited is for the southern side of the Alaska Peninsula, not for the northern side of the peninsula or the North Aleutian Basin.

Response 1-48b

This concern is addressed in Response 1-1e.

Response 1-49

The analysis of the effect of seismic activity on commercial fishing is based on the seismic activity that occurs after a lease sale. Postlease seismic surveys use primarily high-resolution instruments to evaluate geologic hazards for drill-site clearance. Between 1985 and 1992, it is estimated that 1,362 trackline miles would be surveyed for drill-site clearance at 12 locations. In addition to drill-site clearances, an estimated 845 miles of high-resolution survey would be required prior to the installation of one oil and one gas pipeline from offshore platforms to Herendeen Bay.

Response 1-50

Section IV.A.1.b. (Anticipated Geophysical Activity) provides an estimate of the amount of postlease seismic activity that would occur when commercial quantities of oil and gas are discovered. As indicated, the level of postlease seismic activity depends on the number of exploration and delineation wells that would be drilled and the length of offshore pipelines. The MMS does not mean to imply that seismic activity does not occur prior to a sale; however, the EIS analyzes only those activities that would result from the proposal. If subsequent sales occurred in the North Aleutian Basin, seismic activities resulting from those sales would be analyzed in subsequent EIS's.

Response 1-51a

Section IV.A.1.b. of the EIS indicates that 1,362 trackline miles of seismic surveys would be conducted for drill-site clearances at 12 locations, and 845 trackline miles for siting of 12 offshore pipelines. As indicated in Response 1-50, the EIS makes no assumptions concerning presale surveys and analyzes only postsale activities. For this reason, the MMS feels that the level of effects assessed on commercial-fish-harvest activities is low.

Response 1-51b

The EIS assesses effects on fixed fishing gear. The George Ferris incident occurred as a result of a state lease sale in Cook Inlet, not a federal sale.

Response 1-52

This concern regarding the magnitude of seismic-survey activity is addressed in Responses 1-49, 1-50, and 1-51a. Present limited fishing seasons (for example, the 1984 Bristol Bay red king crab season) were open for less than 2 weeks when the quota of 5 million pounds was reached. Future seasons probably will extend over longer periods as red king crab resources again increase. The harvest period for Bering Sea shellfish fisheries is fall through winter and into early spring. Seismic surveys usually are conducted during the late spring through early fall seasons; therefore, there may be little or no conflict between these activities.

Halibut and other longline fisheries also occur in limited time periods; thus, with coordination and communication between the oil and fishing industries, potential space-use/gear-loss conflicts are not expected to occur.

Response 1-53

Currently used seismic-energy sources on the OCS are deemed relatively innocuous to fisheries resources. The surveys also do not seem to conflict with commercial fishing operations when properly coordinated with the commercial fishing industry (seismic-survey-permit applications are public documents that may be reviewed by the state).

Response 1-54

In developing this estimate, the best available information from incidents that occurred elsewhere was analyzed, and a comparison of platform numbers and pipeline miles was used to reach this conclusion (North Aleutian Basin resource estimates were used to arrive at these numbers). Support bases, rig-storage areas, and tanker terminals infringe only on minimal areas; in any case, these oil-industry facilities may be readily sited outside fishing areas. To date, limited exploration in the St. George and Navarin Basins has posed no conflicts with, or problems for, the commercial fishing industry in these areas.

Response 1-55

Based on current operations at Unalaska and Cold Bay, this competition has not materialized to any degree, and further increased exploration/development should not cause drastic incremental effects. Increased demand for materials and services may even reduce transportation and other costs for the fishing industry, as more efficient systems are implemented. Just as much of the fishing industry does not consider Gulf of Mexico and Cook Inlet oil and gas development experience applicable to the Bering Sea, the Department of the Interior does not consider the Shetland Islands and Scotland--with their limited logistical potential and much smaller area of offshore operations--directly applicable to those of the United States and Alaska. There are presently a number of undeveloped and unused areas adjacent to the North

Aleutian Basin that could be used to support offshore oil and gas activities without conflicting with the logistics of the commercial fishing industry.

Response 1-56

At present, the fishing industry seems to have little difficulty in recruiting employees. With the present unemployment rates in both Alaska and other states, it does not appear likely that a shortage of labor would develop to the extent that the fishing industry would suffer for lack of manpower. Also, many of the jobs in the two industries require specialized job skills, another indication that changes in employment would be quite unlikely.

Response 1-57

To date there is no empirical evidence to show that fish behavior is adversely affected by currently used seismic-energy sources. An analysis of the effects of seismic energy sources is included in Section IV.B.1.a.(1). There are a number of natural events that disperse or otherwise alter fish movement/behavior without lasting effect to either the organism or the fishery. Seismic-survey areas on the OCS are well away from the salmon/herring fisheries. Seismic surveys within 3 miles of shore, where virtually all salmon/herring fisheries occur, are regulated by the State of Alaska. Trawl fisheries on the OCS operate over extensive areas, many year-round, while seismic surveys are short term and area-limited. Fishing vessels and seismic-survey vessels also are subject to marine-navigation rules that further reduce close proximity. Crab-pot/longline fisheries may be affected where this gear is concentrated. This may require that seismic surveys be deferred during these short-season, highly intensive fisheries, or that some means of preventing gear loss be employed. The Oil/Fisheries Group of Alaska operates to reduce conflict between the industries.

Given the already considerable amount of seismic data collected, the level of seismic activity associated with this lease sale would be limited to that required for siting of drilling operations and pipeline routing, as forecasted in the EIS. To date, there is no empirical evidence that fish behavior is affected by seismic-survey operations.

Response 1-58

The MMS does not concur with these recommended revisions and believes that the analysis leading to presently assessed conclusions is based on substantive information, which concludes that gear-loss damage would occur as follows (from Centaur Associates, 1983):

- Trawl gear	0 - 1.5 claims annually
- Crab-pot gear	120 annually
- Longline gear	2 - 4 poles annually
- Gillnet/purse-seine gear	No effect

These figures represent a less-than-1-percent increment of the present loss.

The projected 1,362 miles of seismic lines for this project do not constitute a significant effect insofar as they are outside the salmon fisheries, have no effect on groundfish fisheries, and, with coordination, can readily operate outside the pot fisheries.

In part, these overall conclusions are based on Ingram et al. (1982), Centaur Associates, Inc., and Dames and Moore (1982). The MMS cannot agree that undocumented "feasible scenarios, past experience, and analogous case histories" merit revision of this conclusion.

Response 1-59

Figures III-1 and III-2 have been modified to add the proposed lease sale area.

Response 1-60

Mysids (opossum shrimp), like other pelagic zooplankton of the eastern Bering Sea, vary in abundance and distribution with environmental conditions, which in turn vary over a wide range during a period of years. Therefore, considering these natural variations, it does not appear practical to further delineate abundance and distribution. In any event, mysids are only one group among several that are necessary for this ecosystem state.

Response 1-61

Table III-43 provides the ranges of trace-metal concentrations in the water column and sediments of the southeastern Bering Sea.

Response 1-62

Table IV-3 has been revised to indicate the source of drilling effluents.

Response 1-63

Table IV-1 has been revised to include the quantity and time interval for disposal of production-phase drilling muds.

Response 1-64

Further discussion regarding shoreline persistence of spilled oil has been added to Section IV.A.3.e. (Extent of a Shoreline Spill).

Response 1-65

The reference to the state's offshore-Bristol Bay sale has been added to Section IV.A.6.a.

Response 1-66

As referenced in the DEIS, the assumed drilling-fluid-dilution rate of 10,000:1 at 100 meters was taken from a study by Dames and Moore (Houghton et al., 1980), and from two papers in a 1980 symposium on the fate and effects of drilling fluids (Ayers et al., 1980a, 1980b). The text has been clarified to reflect the lack of a dispersion study specific to the North Aleutian Basin.

Response 1-67

The text (Sec. IV.B.1.a.(1)(b) of the FEIS) has been amended to reflect this concern.

Response 1-68

The text (Sec. IV.B.1.a.(1)(a) of the FEIS) has been clarified.

Response 1-69

The basis for assuming that an oil spill of 100,000 barrels might spread to cover 200 km^2 in the North Aleutian Basin is discussed in Section IV.A.3.d. (Fate and Behavior of Spilled Oil) of the FEIS.

Response 1-70

The key to the magnitude of these effects is the benthic area apt to contain hydrocarbons, and the period. "A field experiment conducted in a moderate-energy environment (Kachemak Bay, Alaska) indicated that while 100 ppm of Cook Inlet crude oil mixed into the benthic sediments was completely degraded after 1 year, 50,000 ppm was unchanged in quantity and composition" (Griffiths and Morita, 1980).

The grounding of the Amoco Cadiz off the coast of France in March 1978 provided more field data. Intertidal sediments near the spill site contained in excess of 1,000 parts per million (ppm) shortly after the spill; this concentration had decreased to approximately 2 ppm by the following March (Calder and Boehm, 1981). Due to the comparatively light benthic oil concentration calculated above, and the comparatively high energy of the North Aleutian Basin benthic environment as indicated by sand-grain sizes greater than 32 meters, it is thought that the maximum residence time of the sedimented oil in this area would be 1 year (Proceedings of a Synthesis Meeting: The North Aleutian Shelf Environment and Possible Consequences of Offshore Oil and Gas Development, Anchorage, Alaska, March 9-11, 1982).

One possible scenario describes a 200,000-barrel oil spill at Rust Rock on the southern coast of the Alaska Peninsula that would distribute potentially lethal hydrocarbon concentrations (0.01 ppm) over an area of 407 km^2; however, quantities that sink to the benthos would contact a much smaller area of ocean bottom. Essentially, even in the most environmentally sensitive areas, such as lagoons and embayments, the affected area would be only a small fraction of the total.

Response 1-71

Concentrations of hydrocarbons following a spill in nearshore waters cannot be hypothesized because they depend on a myriad of site-specific factors, including the type and amount of oil spilled and oceanographic and meteorological conditions including temperature, salinity, wind, currents, water depth, and wave height, which influence the disposition of oil. In pelagic waters, an upper limit of the concentrations generally observed following an oil spill has been established. For purposes of analysis, nearshore concentrations following an oil spill are assumed to be greater than concentrations in pelagic areas, and mortality of all lifestages is assumed.

Response 1-72

The discussion of potential effects on salmon in the Port Moller area (Sec. IV.B.1.a.(1)(b), Paragraph 14, of the DEIS) acknowledges the Department of Environmental Conservation's hypothesis that hydrocarbon concentrations may be high enough following a major oil spill off Port Moller to cause lethal effects on some lifestages: "Effects of an oil spill contacting nearshore areas within 3 days while hydrocarbon concentrations are relatively high could include mortalities . . . This could result in a change in distribution and/ or abundance of a portion of the regional population of one or more salmon species over more than one generation."

Response 1-73

The text has been amended to indicate that drilling fluids, cuttings, and formation waters are not diluted prior to discharge (see Sec. IV.B.1.a.(1) of the FEIS). The analysis of potential environmental consequences for the proposal is based on the oil resource estimate of 364 MMbbls. Based on this resource level, 42 (10 exploration and 32 production) wells are projected. In the maximum case, based on a resource estimate of 759 MMbbls, 59 exploration

and production wells are projected. Appendix A analyzes the environmental consequences on fisheries resources for the maximum-resource case.

Response 1-74

Because the discussion in Section IV.B.1.a.(1)(b) acknowledges 100-percent mortality of herring embryos at 1 ppm, assumes that near-shore waters may have hydrocarbon concentrations greater than 1 ppm and concludes that "eggs and larvae may experience lethal toxicities," it is superfluous to consider the effects of lower hydrocarbon concentrations (i.e., 96-hr LC_{50}).

Response 1-75

Effects are not based on the probability of an event occurring. Rather, the analysis assumes that an event (i.e., an oil spill) occurs and affects the resource(s) of concern. This analysis is often accompanied by a statement of the probability of the event occurring. In order to focus the assessment of effects, the analysis may not discuss events that have an extremely low or negligible probability of occurrence. For example, if an oil spill has a less-than-0.5-percent chance of occurring and contacting a certain area, the analysis of effects on the resources inhabiting that area are not discussed in detail.

BILL SHEFFIELD, GOVERNOR

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF PARKS AND OUTDOOR RECREATION

225A CORDOVA STREET
ANCHORAGE, ALASKA 99501
PHONE: (907) 276-2653

MAILING ADDRESS:
POUCH 7001
ANCHORAGE, ALASKA 99510

2

February 25, 1985

Re: 1130-9-8
3440 (MMS)

Subject: DEIS North Aleutian Basin Sale 92

Thomas H. Boyd
EIS Coordinator
Minerals Management Service
P.O. Box 101159
Anchorage, Alaska 99510

Dear Mr. Boyd:

Thank you for submitting a copy of this environmental statement for our review. We understand that we were on your mailing list, but that the address was incorrect. We have been contacted by Mr. Everett Tornfelt of your office who has corrected the address. Subsequent communications from your office should reach us and be reviewed within a timely fashion.

2-1 We have reviewed the referenced document and also have received a copy of the Advisory Council on Historic Preservation comments. We must agree with them that the DEIS contains much good information on submerged resources in the sale area, but that it fails to address potential effects of on-shore activities resulting from a sale. We suggest that some information be added to the DEIS under Section F.3 (page IV-F-8) that addresses not only potential effect, but probable measures for protection of those on-shore resources should any sales occur.

2-2 We understand that the DEIS represents an early planning stage for the potential of oil and gas lease sales and that MMS does not necessarily control the locations or types of on-shore facilities. However, facility locations and transportation scenario are described in the DEIS and would in all probability be very similar to ones actually proposed as a result of any lease sales. Therefore, MMS should provide, under Section 106 of the National Historic Preservation Ace of 1966, as amended, a description of potentially affected on-shore cultural resources. MMS should also propose mitigation measures for those cultural resources which may be on or eligible for the National Register of Historic Places.

2-3 We take this opportunity to remind MMS that many of the World War II facilities in the sale area have been determined eligible for the National Register. This fact must also be incorporated into your DEIS. We can provide further details on this action at your request.

In summary, the DEIS goes a long way toward covering cultural resources, but needs to address on-shore activity and protection of on-shore cultural resources. We join the Council in offering our assistance with these concerns. Please feel free to contact us at your convenience (265-4141).

Sincerely,

Neil C. Johannsen
Director

Judith E. Bittner

By: Judith E. Bittner
State Historic Preservation Officer

DR:tls

Response 2-1

References to the U.S. Army Corps of Engineers' Environmental Assessment of World War II sites and to the State Historic Resources Files, and a listing of sites in the Sale 92 area, have been provided in the text (Sec. IV.F.3. of the FEIS). The detailed description of each site and its location is provided by the State Historic Resources File (see Appendix J, Table J-1), which meets the Section 106 requirement of the National Historic Preservation Act of 1966. Under the tiering approach of the CEQ regulations, possible effects on onshore cultural resources would be addressed by appropriate state and federal agencies prior to development and production. At that time, appropriate mitigating measures could be developed.

Response 2-2

This concern is addressed in Response 2-1.

Response 2-3

The Sale 70 FEIS, which has been incorporated by reference in this FEIS, lists World War II sites on the Alaska Peninsula that were on the National Register in August 1982. The State of Alaska Historic Resources File (1985) also is incorporated by reference in this FEIS. We have contacted the State Historic Preservation Office regarding new sites, and it was confirmed that all new National Register sites in the forthcoming Corps of Engineers environmental assessments will be reflected in the State Historic Resources File; thus, the reference to that file in this FEIS provides current coverage of National Register sites.

3

Alaska State Legislature

House of Representatives

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DISTRICT 26

ADAK
AKUTAN
ALEKNAGIK
ATKA
BELKOFSKI
CLARK'S POINT
COLD BAY
DILLINGHAM
DUTCH HARBOR
EGEGIK
EKUK
EKWOK
FALSE PASS
IGIUGIG
ILIAMNA
KING COVE
KING SALMON
KOKHANOK
KOLIGANEK
LEVELOCK
MANOKOTAK
NAKNEK
NELSON LAGOON
NEWHALEN
NEW STUYAHOK
NIKOLSKI
NONDALTON
PEDRO BAY
PILOT POINT
PORT ALSWORTH
PORT HEIDEN
PORT MOLLER
PORTAGE CREEK
SAND POINT
SOUTH NAKNEK
SQUAW HARBOR
ST GEORGE
ST PAUL
TOGIAK
TWIN HILLS
UGASHIK
UNALASKA

RECEIVED
MAR 14 1985
REGIONAL DIRECTOR, ALASKA OCS
Minerals Management Service
ANCHORAGE, ALASKA

6 March 1985

Mr. James Hodel, Secretary
Department of the Interior
C Street, between 18th
and 19th Streets, N.W.
Washington, D.C. 20240

Dear Secretary Hodel,

As Representative of District 26 which includes Bristol Bay, the Aleutian Chain and the Pribilof Islands, I am writing to you to formally express my opposition to the proposed North Aleutian Shelf federal oil and gas lease sale.

I have reviewed the Draft Environmental Impact Statement (DEIS) prepared by the Minerals Management Service (MMS) and strongly urge that the proposed sale be dropped from federal the Five Year OCS Lease Schedule. As you know, the State of Alaska is officially opposed to this lease sale and I wholly support this position.

I want to stress that the concerns I have about the proposed North Aleutian Sale 92 are not based on blanket opposition to oil and gas development. However, it is essential that the unique biological resource values of Bristol Bay be given appropriate respect. The economic and subsistence value of the Bristol Bay fishery is well known. The salmon fishery alone is worth hundreds of millions of dollars annually and employs thousands of Alaskans. The entire region's economic health is dependent upon the health of the fisheries. If protected, the biological resources of Bristol Bay will continue to produce food, jobs and tax revenues forever.

The enormous value of the living resources in Bristol Bay are recognized throughout the world. However, our knowledge of the biology of these living resources is very limited. This is especially so with respect to the fishery resources of Bristol Bay. Although a great deal of data is presented in the DEIS, information on a number of very fundamental issues is definitely lacking.

I will not attempt to list the many shortcomings with the DEIS which have been identified by others. It is obvious, however, that very basic questions remain unanswered about the distribution, migratory patterns and life cycle needs of salmon, herring, capelin, and king crab. In general, the DEIS fails to evaluate adequately the biological resources of Bristol Bay.

I am particularly disturbed that the DEIS fails to address meaningfully the consequences of oil spill impacts at the local level. Even the DEIS acknowledges the potential for substantial impacts if a spill were to occur in or near fishing areas while the season was in progress. As noted in the DEIS, this would include fouling of gill nets, purse seines, crab-pot buoys and/or groundfish trawls and could result in closure of the fishing grounds. As a practical matter, on the local level, the economic implications of such a closure, even if only for a brief period, could be disastrous.

3-1 As you are aware, the State has previously addressed the issue of oil and gas development in the marine waters of Bristol Bay as part of the Bristol Bay Area Plan (BBAP). This plan generally stipulates a moratorium on the leasing of tidelands until at least 1994. The final BBAP was the product of a lengthy public process involving the general public and local governments as well as appropriate federal and state resource agencies. The plan is a consensus document representing a broad spectrum of interests and viewpoints. The moratorium policy was developed after careful review and evaluation of the many resource values involved . The moratorium is a well-reasoned and prudent public policy for the state tidelands. It is also appropriate for the federal OCS as well.

It is important to note that BBAP identifies several areas along the Bristol Bay coastline as providing essential habitat for fish, waterfowl and marine mammals and that these areas should be closed indefinitely to leasing. This includes the tide and submerged lands of the Fisheries Reserve as well as certain bays and lagoons along the north coast of the Alaska Peninsula, specifically, the Cinder River estuary, Port Heiden, Seal Islands Lagoon, Port Moller, Herendeen Bay, Nelson Lagoon, Moffet Lagoon, and Bechevin Bay.

3-2 The proposed federal sale has great potential to directly impact these crucial habitat areas, particularly those along the southern end of the Alaska Peninsula closest to the federal sale area. In fact, the DEIS indicates that there is a 61% chance that oil development would result in at least one spill of greater than 1,000 barrels and that the chance of such a spill impacting Port Moller was virtually certain, ie, 99.5+%. Further, it is generally acknowledged that state-of-the-art oil spill response technology is inadequate to contain or clean-up an oil spill in sea states that are common in the area of the sale.

In contrast to the enormous biological values, the estimated hydrocarbon resources of the area are insignificant. The DEIS reports an expected value of 364 million barrels. This is less than one month of U.S. oil consumption. In the context of overall Alaska OCS potential, the Bristol Bay area represents only about 2% of Alaska's potential, as estimated by the National Petroleum Council.

In response to the argument that there is a national interest to be served by hydrocarbon development in Bristol Bay I must insist that there are far more important national and international values involved which justify protecting the fisheries of this region. When the many different resources of the Bristol Bay region are put into proper perspective, it simply does not make sense to jeopardize the enormous -- and potentially infinite -- renewable fishery resources of the area for a few more days of oil. There are other, less vulnerable areas both onshore and offshore to explore for and develop hydrocarbon resources.

Again, I ask that the federal government to reconsider its intention to proceed with Sale 92 and to defer this proposed sale indefinitely.

Sincerely,

Ms. Adelheid Herrmann

Adelheid Herrmann
Representative
District 26

cc: Alan Powers, MMS

Response 3-1

This EIS discusses the consequences of an oil spill and finds the probability of occurrence and the subsequent effect on commercial fishing to be generally at a 0.5- to 2-percent occurrence-contact risk for virtually all nearshore fishing areas eastward of Port Moller and into Bristol Bay; and the occurrence-contact risk is up to 19 percent from Port Moller west but not beyond the North Alaska Peninsula area north of Pavlof Bay. Only 1 oil spill of 1,000 barrels or greater is projected to occur over the life of the project, and this volume would affect only a marginally small part of the Bering Sea fisheries--and then only if a spill occurred during a given fishing season. We believe that this analysis adequately addresses the risks to the environment. In the rare event that an oil spill did affect the commercial fishery, there are provisions in place to compensate the fishermen (Sec. II.C.1.a.).

While a moratorium on the leasing of state tidelands and waters for oil and gas exploration/development may be a reasonable policy for the state, such limited areas are not comparable to the larger, offshore open-water areas of the North Aleutian Basin.

Response 3-2

The probability of 1 or more spills of 1,000 barrels or greater occurring as a result of Alternative I is 61 percent. However, for Alternative I, the probability of 1 or more spills of at least 1,000 barrels contacting the shoreline of the Port Moller area is only 1 percent within 10 days of spillage, and 3 percent within 30 days of spillage. There is only a 20-percent chance through 10 days and a 24-percent chance through 30 days that 1 or more such spills would contact or pass within 50 kilometers of Port Moller.

The greater-than-99.5-percent chance of oil contact referred to by the commentor is a conditional probability that, assuming a spill has occurred at Launch Point D1 (a specific hypothetical launch point within 50 km of Port Moller), the spill would contact offshore waters within 50 kilometers of Port Moller.

Further discussion of oil-spill-response capability in the open ocean has been added to the text (Sec. IV.A.4. of the FEIS).

ALEUTIANS EAST COASTAL RESOURCE SERVICE AREA
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ANCHORAGE, ALASKA 99501
(907) 276-2700

4

March 12, 1985

Mr. Alan Powers
Alaska OCS Region
Minerals Management Service
P.O. Box 101159
Anchorage, Alaska 99510

Subject: Aleutians East CRSA Comments on the North Aleutian Shelf Draft Environmental Impact Statement.

Dear Mr. Powers:

The Board passed resolution 85-3, on February 22, 1985, in support of Governor Sheffield's position for a delay of the N. Aleutian Shelf lease sale until at least 1994. This will assure that the data gaps identified by the State are adequately addressed; that the industry catch up with oil spill cleanup and containment and transshipment technology; and that the region is afforded the opportunity to complete the Aleutians East CRSA Coastal Management Plan and that the State and federal government approve the plan and incorporate it into State and federal consistency reviews.

The Aleutians East CRSA Board has reviewed the North Aleutian Shelf DEIS and has concluded that the lease sale as proposed in the DEIS is not consistent to the maximum extent practicable with the State Coastal Management Program nor with the Aleutians East CRSA public hearing draft Coastal Management Plan. In Section E of the General Comments herein the Board identifies measures that need to be taken in order for the Board to consider the lease sale to be consistent with the Aleutians East public hearing draft CMP.

The timing of the lease sale in relation to the Aleutians East CRSA program is unfortunate. The Aleutians East CRSA does not have an approved program. The Board has been rigorous in producing a plan and is pleased that the public hearing draft is out for review. The policies in the draft plan reflect the Board's position regarding 'balanced development' in the Aleutians East region. As you know the North Aleutian Shelf lease sale area is adjacent to the Aleutians East region. The major potential impacts are all directed at the nearshore areas of the north and south side of the Aleutians East CRSA. If a hydrocarbon resource is found the Aleutians East Board will review the permitted activities using the approved Aleutians East Plan as a guide. In light of this the Board has thoroughly reviewed the North Aleutian Shelf DEIS with the Board's knowledge of the region and the public hearing draft policies in mind.

The Board comments are divided into two parts.

1. General Comments on the DEIS including the Aleutians East CRSA policies that need to be incorporated into the DEIS stipulations and ITL's; and

2. Specific Comments on the DEIS.

The Board looks forward to your response to our comments. We would appreciate receiving a current schedule of your plans for publishing the final EIS and Proposed Notice of Sale.

Sincerely,

Stanley Mack (sm)

Stanley Mack
Chairman Aleutians East CRSA Board

cc: CRSA Board
BBCRSA Board
City of Sand Point
City of King Cove
City of Cold Bay
False Pass Village Council
Nelson Lagoon Village Council
Rep. Hermann
Rep. Zharoff

Att: I. Aleutians East CRSA draft CMP Policies
II. Special Use Area, Resource Values and Concerns

V-78

PART I

GENERAL COMMENTS

A. Resource Documentation

1. Fishery Data Gaps

In general the documentation of natural resources is inconsistent. The DEIS's strong point is that it provides a good summary of the fishery resources and life stages of the major fishery species in and near the lease sale area. However, resource information on particular species or habitats for the near shore areas is incomplete.

A summary of the data gaps identified on fisheries by the Department of Fish and Game and United Fisherman of Alaska are provided below.

a) Resource reports not complete or information needed to adequately assess the impact of oil and gas development on fisheries.

Salmon:

1) Seaward migration patterns of juvenile salmon -- kings, chum, coho, and pinks, as well as sockeye.

4-1a

2) Duration of time juvenile salmon remain in nearshore waters of outer Bristol Bay, and the degree to which they utilize coastal bays and lagoons.

3) The ability of juvenile salmon to detect and avoid oil contaminated waters; chronic low-level effects of oil.

4) Degree of interference oil has on adult salmon seaward and spawning migration; avoidance capabilities.

5) Potential for seismic energy sources to disperse salmon.

Herring:

1) Distribution and abundance of adult herring that spawn in the lease area; (1) during spawning in nearshore waters; and (2) outside of spawning season.

2) Migration pathways of adults and juveniles that utilize the North Aleutian Shelf but spawn outside of the lease area. Including the 3,200 metric ton Herring fisheries in Unalaska and Akutan Bays and the two-three tons sac roe fishery in Port Moller/Herendeen Bay.

3) Distribution of larval herring in surface waters after hatching.

4) Impact of an oilspill on all lifestages of herring.

5) Impact on spawning substrates (Fucus, Zostera) used by herring.

Capelin:

1) The lethal and sublethal effects of oil contamination on all life stages of capelin: eggs, embryos, larva, juveniles and adults.

2) The distribution and abundance of larval, juvenile and adult capelin, and the delineation of nearshore spawning areas.

3) The impact of an oil spill on capelin spawning areas (sand and gravel beaches) including the susceptibility of beaches to oil contamination, and the degree and length of time affected.

King Crab:

1) The distribution, abundance and population dynamics of all life stages of king crab in nearshore waters of the North Aleutian Shelf.

2) The impacts on king crab larva and juvenile recruitment in Bristol Bay.

3) The onshore-offshore migratory behavior of egg-bearing female king crab.

4) The potential for direct hydrocarbon uptake by king crab eggs, and the subsequent effects such as reproductive changes and success.

2. On-going Studies

The MMS has studies currently being conducted that are to be completed after the lease sale is scheduled. These studies and the identified data gaps need to be satisfactorily addressed before the Secretary can fully and fairly evaluate the impacts of oil and gas development in the North Aleutian Basin.

3. Special Use Areas In Aleutians East Region

Additionally the DEIS does not adequately cover the significance of the nearshore areas identified by the Aleutians East CMP public hearing draft as Special Use Areas. In the public hearing draft the Aleutians East Board has identified five special use areas relevant to the North Aleutian Shelf Lease Area.

1. Port Moller/Herendeen Bay
2. Nelson Lagoon
3. Izembek Lagoon Special Use Area
4. Bechevin Bay Special Use Area
5. Unimak Pass Special Use Area

4-1b

These areas hold unique environmentally vulnerable or commercially important fish and wildlife resources and habitats. A summary of the Special Use Area resource values and concerns is provided as Attachment 3 herein. The Board has chosen to highlight the Special Use Area primarily for their value to the subsistence and commercial fishery. Policies have also been introduced by the Board to address special use area concerns. Special consideration needs to be offered in the environmental impacts section of the analysis, and the Aleutians East Special use Area policies need to be applied to the lease sale stipulations or ITL's to assure that these areas remain commercially productive and that fishing opportunities continue without interference. (See Section E on proposed stipulations)

B. Impacts of Oil and Gas Development

4-2

The DEIS identifies that the major impact of oil and gas development is an oil spill. Considering the cumulative case, oil and gas development in all the Bering Sea basin and Canadian Beaufort Sea, the probability of an oil spill of 1,000-100,000 bbls occurring ranges between 3%-99%. In other words, in the instance that a resource is found the potential for a spill is real*. When the potential for a spill is combined with the high probability for oil contacting the shore, 99.5% to Port Moller, the Board's concerns are magnified. With the probability for an oil spill the impacts section has the following problems:

1. The DEIS underestimate the potential for harm to fishery resources from the proposed oil and gas development in a number of ways:

a) the oil spill risk analysis is based on nationwide oil spill data;

4-3

NOTE: This probability assumes a low potential to find an economical resource. At the Anchorage hearing February 26, 1985, Mr. Peter Hanley with Sohio Alaska commented that the MMS's assessment of the likelihood for an economic resource is low.

4-4 b) The analysis does not take into consideration that the lease sale area and Alaska Peninsula is an active seismic zone;

4-5 c) the analysis underestimates the extent of a potential spill and the toxic effect of hydrocarbons on fish eggs and larvae, sublethal effects of hydrocarbons, and the effect of hydrocarbons on bethic communities.

4-6 2. The fate and behavior of spilled oil only applies to the lease sale area which is out at sea. If a economical resource is found the DEIS assumes a pipeline to Port Moller/Herendeen Bay and across the Alaska Peninsula to Balboa Bay. Table IV-15 in the DEIS identifies that if a spill of 1,000 barrels or greater occurs in the lease sale area, there is a conditional probability of 99.5+ for oil to contact Port Moller. While the DEIS assumes it is likely for oil and gas to contact the Port Moller/Herendeen Bay area it fails to assess the fate and duration of spilled oil in Port Moller due to tidal action.

4-7 3. The oil spill risk analysis fails to provide a discussion on the potential for an oil spill to occur from a ruptured pipeline nearshore or within the Bay or tanker/supply boat and assess the likely impact on the nearshore environment.

4-8 4. Major impacts are identified as local and not affecting the Bering Sea regional resource populations. However, the actual effect of a spill is dependent on the time of year and weather conditions the effect of a major spill (100,000 b barrel oil spill covering 200 sq. kilometers) on a localized area could effect the entire basin because of temporal and spatial segregation of stocks. (For instance a spill in a small area where a year class concentrates, ie) consider a 200 sq. mile slick along the N. Peninsula coast where larval king, tanner crab, herring, pollock and juvenile salmon concentrate.)

4-9 5. While there is some indication of the eventual fate of spilled oil to the nearshore environments the DEIS does not identify specific impacts on, or the full magnitude of, a spill on the local area's resources. For example the impact locally to the Nelson Lagoon fishery could be very significant to Nelson Lagoon fisherman but not significant to the Bristol Bay fishery as a whole.

4-10 6. There has not been a analysis of oil spill response capabilities in the North Aleutian Shelf Basin.

7. As mentioned above the DEIS assumes transshipment of oil will be either by, 1) pipeline from Herendeen Bay across the Peninsula to Balboa Bay, or 2) from offshore loading to tankers through Unimak Pass to Balboa Bay where the crude will be transferred by shuttle tanker to large tankers.

In the first case and as mentioned above in item 2) (on page 4) the DEIS:

4-11 a) fails to provide an analysis of the effect of a spill inside Port Mollér/Herendeen Bay resulting from a ruptured pipeline or supply boat;

4-12 b) suggests the possible need for a causeway from the head of Herendeen Bay out into the bay but fails to identify potential impacts on anadromous fish migration, water quality, gravel needs etc.

4-13 c) fails to adequately discuss transshipment difficulties out of Balboa Bay. Examples of some difficulties are, 1) loading of large crude carriers would have to be conducted well out in the bay, 2) the crash stop length of a VLCC ship of 200,000 DWT or larger is nearly 5 kilometers, 3.1 miles, at 15 knots.

4-14 d) fails to provide an oil spill risk analysis for tankers leaving Balboa Bay or a trajectory analysis for tanker traffic and/or a potential spill.

In the second case where oil is transshipped from the rigs through Unimak Pass the analysis underestimates potential impact. Particularly in light of the fact that Unimak Pass has been identified in the DEIS as the possible passage route for the Navarin, St. George, Norton and possibly Canadian Beaufort Lease Sales. (page IV-A-23)

The AOGA comments at the Anchorage Public Hearing recommended that the MMS analysis should have emphisized the use of super-tankers to ship the crude directly to market. If the industry is supporting offshore loading then the State and Aleutians East region need to re-evaluate the costs/benefits of the lease sale to the state and local economy and the DEIS analysis needs to analyze this option more carefully.

8. Other miscellaneous impact related concerns.

4-15 a) Oil spill trajectory simulations. The oil spill risk analysis is only as good as the data put into the system. Some of the data is incomplete and therefore the simulations may not be totally valid. The United Fishermen of Alaska comments provide specific concerns regarding the oil spill trajectory model.

4-16 b) State of the art cleanup and containment equipment automatically precludes effective containment of clean-up because of the sea state in the Bering Sea. The equipment is for seas up to 6'-8', seas in the Bering Sea are 20'-25'.

4-17 c) The sublethal effects of hydrocarbon materials occuring at very low levels is not really recognized in the analysis.

C. Inconsistencies in the DEIS and MMS Reports

The Board also found an inconsistency between the MMS report number 110 and the alternatives provided in the DEIS. Report number 110 page 3-121 indicates that a pipeline greater than 10 miles may not be feasible based on properties of crude similiar
4-18 to that found in the Bering Sea. If this is true the proposed alternatives suggesting a pipeline for the lease sale area to shore would not be feasible. Rejection of the pipeline option would require offshore loading and transshipment to shore. This could substantially alter the environmental and economic impacts section.

Without the pipeline option the region and State of Alaska's ability to take advantage of oil and gas development is drastically reduced, if this were the case the Board's overall position on the lease sale could change substantially.

D. Impacts on Commercial Fishing

The analysis underestimates the potential impacts of space and catch loss on commercial fishing activities. The analysis misre-
4-19 presents the perspective of the N. Sea commercial fishermen as provided by John Goodlad in the Shetland Islands Conference held in Sand Point, Alaska. Last year the Aleutians East CRSA sponsored a workshop on the impact of oil and gas development in the N. Sea. John Goodlad represented the Shetland Island Fishermans Association. Mr. Goodlad shared the opinion of the fishermen that while the fishing and oil industries have had to learn to live together, the Shetland experience has been one of conflict caused by having the users of the seabed with many different aims, methods and purposes. Mr. Goodlad contends that now, over a decade after major production had begun Shetland fishermen are only begining to learn from the mistakes that were made.

The priority problems between the fishing and oil industries identified by Mr. Goodlad are:

Safety and navigation - this was a problem initially and resolved satisfactorily for both oil and fish industry.

Loss of access to traditional fishing grounds - ongoing problem

Oil related debris - ongoing problem (see specific comments on P-IV-B-90 pg. 21 of comments herein).

Pollution - ongoing concern.

The Aleutians East Board draft policies attempt to mitigate these concerns to avoid conflicts in the Aleutians East Area.

The Board is very interested in the concept of compensation of lost fishing opportunities including loss of fishing grounds and gear damage. The Board is researching whether of not the existing compensation program is adequate to cover potential claims and whether fishermen in other parts of the country (ie. Calif.) are satisfied with the results they are experiencing.

Seismic operations are another concern to fishermen. Over the past few years the Board has followed seismic operations in the area adjacent to the Aleutians East Region. Since the Minerals Management Service has not provided the State with seismic operation permits the Board has not been able to alert the MMS to times when seismic operations might interfere with commercial fishing operations. A problem with a seismic operator has occured in the Aleutians East area, and the Board is aware of the complaints registered by fishrmen operating in the Shelikof Straits and Cook Inlet. The Board understands that the DEIS underestimates the trackline miles which may be shot. When this is coupled with the historic intensity of fishing in and around the lease sale area the conflict is far more likely to be at least a "moderate" problem rather than "minor" as suggested by
4-20 the DEIS. Potential problems could be mitigated by the MMS coordinating review of permit applications with the State of Alaska, local government and the Aleutians East CRSA Board and following the policies as proposed in the draft Aleutians East CRSA Coastal Management Plan.

E. Relation between the Aleutians East CMP and the DEIS

The Aleutians East CMP public hearing draft is currently
4-21 available for review. The DEIS needs to be rewritten to reflect the plan policies and special use areas. The timing of the lease sale in relation to the Aleutians East CRSA program is awkward. The earliest the Aleutians East CRSA plan will receive State approval is in September and Federal approval is in November. While the Board understands that State consistency is not required for a lease sale any activity that requires a permit and could have a direct effect on the coastal zone is subject to a consistency determination. The Aleutians East Board will review all projects using the Aleutians East CMP plan policies. It is only fair to industry for the Aleutians East plan to be completed before the lease sale, so that they are aware of the conditions under which a permit will be reviewed.

One reason the region decided to organize a CRSA was to establish a means to negotiate with the permitting agencies and the oil and gas industry. The board has produced a draft plan that takes advantage of lessons learned by the fishing industry in the N. Sea and California and provides guidelines under which the Board feels oil and gas development is acceptable. Because of unfortunate timing, the DEIS has inadvertantly by-passed the concerns of the area most likely to be affected by oil and gas development should it occur.

The DEIS recommends five stipulations to be included in the lease sale and nine ITL's. Below the relevant Board policies have an juxtaposed with the proposed stipulations. In some instances the full intent of the Board policies or a particular policy are not addressed in the stipulation. While the Board's plan is not approved now it will likely be approved before the scheduled lease sale date and therefore the policies should be added to the stipulations and ITL's where appropriate.

1) Stipulation #1. Protection of Cultural Resources -

No comment

2) Stipulation #2. Orientation Program -

4-22 Description of commercial fishery should also include detailed maps, up-to-date fishing operations and seasons for the commercial fishery. The program should also include a presentation on major mitigative measures to be implemented for the project including sensitive timing restrictions and sensitive resource areas.

3) Stipulation #3. Protection of Biological Resources -

Consider Aleutians East draft CMP, Fish and Wildlife policies A-1 through A-9, (attached), and Special Use Area policies for:

a) (M) Port Moller/Herendeen Bay/Bear River Special Use Area
b) (N) Nelson Lagoon Special Use Area
4-23 c) (O) Izembek Lagoon Special Use Area
d) (P) Bechevin Bay Special Use Area
e) (Q) Unimak Pass Special Use Area

Stipulation #3 should apply to nearshore areas that might be affected by development or production phases of oil and gas operations. The Information on Areas of Special Biological Sensitivity ITL should be incorporated into Stipulation #2 to assure that the areas important for fishery habitat as idenfitied in the Aleutians East CMP are highlighted and mitigation measured are identified and designed to reduce possible effects of oil and gas development.

4) Stipulation #4. Wellhead and Pipeline Requirements -

4-24 a) Consider Aleutians East draft CMP Energy Facilities Policies G-4, G-5, G-6, G-7 and G-8; and Transportation and Utilities policies H-3, and H-4.

b) Proposal that suggests that "all pipelines, unless buried, including gathering line, shall have a smooth surface design", p. 11-C-5, should be implemented.

c) The Aleutians East Board will strongly support burial of pipelines in high use commercial fishing areas, see draft CMP policy G-6.

5) Stipulation #5. Transportation of Hydrocarbons -

Consider Aleutians East draft CMP Energy Facilities, Transportation and Utilities and Coastal Development Policies.

4-25 Overall the Board is concerned that the mitigation measures are not site specific enough and do not provide adequate protection to fish and wildlife resources, habitats, and harvest activities from the type and magnitude of risks associated with oil and gas development in the North Aleutian Basin. The Board recommends that the DOI review the Aleutians East draft CMP policies develop language which prescribes specific mitigating measures and incorporate the language as enforceable lease terms to ensure impacts resulting from the lease sale are minimized.

The Board will notify the MMS immediately of any changes made to the aforementioned policies in the approval process.

PART II

DETAILED COMMENTS ON THE NORTH ALEUTIAN SHELF LEASE SALE

1. p.xviv Identification of pipeline is inconsistent with MMS
4-26 technical report #110 page 3-121 which placed limit on length of marine and overland pipeline due to oil temp. and pour point. (see point #9 below)

2. Table S-1 Impact on commercial fishing: MMS identifies minor impact on commercial fishing industry the actual impact on the entire Bering Sea fishery may be moderate. The affect on commercial resources may be considerably greater. The estimated
4-27 effect is underestimated for at least two reasons: 1) extent of area a spill could cover is smaller than should be; and 2) toxic effects of oil persist for more than 10 days - up to 8 months expecially in arctic waters.

3. Table S-1 Impact on Community Infrastructure: If a commer-
4-28 cial resource is found impacts will likely be greater than "negligible".

4. Table S-1 note 5. Effects on Unimak Pass vessel traffic would not be "minor" if offshore loading is used for transship-
4-29 ment to final destination. Effects on Unimak Pass could be substantial if other lease sale areas in the Bering Sea are placed under production.

5. p. I-A-2 Item 2. Request for Resource Reports. Why are some of the pertinent nearshore effect studies still ongoing or just started in 1984? (The MMS Dec. 1984 data gaps response
4-30 documents this.) This information is needed to adequately determine impacts in nearshore resources on both the North and South side of the Peninsula.

4-31 6. p. I-D-1 Bering Sea Fisherman's Association mis-spelled (Fishermen's)

7. p. I-D-5 2(a) Gravel extraction from anadromous fish streams. MMS identifies a causeway in Herendeen Bay on page IV-F-21. Gravel will likely be extracted from fish streams to build
4-32 the causeway if that is all that is available. The public hearing draft AE Coastal Management Plan currently prohibits gravel mining in major streams of Special Use Areas. Herendeen Bay is identified as a Special Use Area. (Item M page 7-27 public hearing draft CMP).

8. p.I-D-6 2(b) Oil spill response. The degree of potential
4-33 impact is highly dependent on the ability to contain and cleanup oil spills (Table S-1)

9. p. I-D-6 2(c). Use of Explosives for seismic testing. The Aleutians East Board's policy Energy Facilities Geophysical surveys G-5-2 prohibit use of explosives. MMS should either prohi-
4-34 bit seismic use of explosives or investigate adverse impacts on fisheries resources in detail. The "special case situations are shallow water near shore areas where impact on juvenile salmon could be great if the salmon are concentrated.

Section II

10. p. II-C-16 Alternative IV, Alaska Peninsula Deferral. MMS report #110 indicates that a pipeline greater than 10 miles may not be feasible based on properties of crude oil. If this is the
4-35 case, the alternative and its effects would be inaccurate because offshore loading would be the only means of transferring the oil available. Offshore loading onto shuttle tankers is the preferred method in MMS Report #110.

11. p. II-C-1 If commercial quantities of oil and gas are both
4-36 discovered, two pipelines across the peninsula would result, construction could be either concurrent or staggered.

4-37 12. p. II-C-1 LNG plant and cooling water use could be a concern at Balboa Bay.

13. p. II-C-2 Stipulation No.1, Protection of Cultural Resources (2)(a) additional language needed: "...including
4-38 archaeological and historical sites delineated in the A.E. Coastal Management Plan.

4-39 14. p. II-C-3 MMS Cultural Resource survey only covers lease area, not upland corridors for pipeline or port sites.

15. p. II-C-4 Stipulation No. 2, Orientation Program. The
4-40 program should also include a presentation on major mitigative measures to be implemented for project, including sensitive timing restrictions, and sensitive resource areas.

16. p. II-C-4 Stipulation No. 3, Protection of Biological Resources. Stipulation should identify AE CMP Special Use Areas. MMS information/studies for nearshore areas are incomplete or unfinished. Companies should be notified that should areas of
4-41 special biological importance be identified in these studies their operations may have to be relocated. Question: how does this stipulation protect areas such as nearshore areas which are outside of the lease sale area but adjacent to it (ie. Port Moller/Herendeen Bay)?

17. p. II-C-5 Stipulation No. 4, Wellhead and Pipeline Requirements. See A.E. CRSA Policy G-6 Offshore pipelines, G-7 Offshore
4-42 structure debris, and G-8 Pipeline location and incorporate into Stipulation N. 4. The AECRSA Board should be included in discussion of where pipelines will have to be buried. The AECRSA will request burial in high use commercial/subsistence fishing areas.

4-79 53. p. IV-A-20. In addition to federal and state lease sales is the tankering of Canadian oil identified in Table IV-8 from the eastern Beaufort Sea.

4-80 54. p. IV-A-22. B. Cumulative Oil-spill analysis. Sale 56, 70, and 86 could all add significantly to the assessment of cumulative impacts.

4-81 55. p. IV-A-23 Has use of Balboa Bay for all Bering Sea oil always been proposed? This is a significant factor in estimating the economics of locating a terminal at Balboa Bay.

4-82 56. . p. IV-B-2 Assertion that oil slick on the water surface remains toxic to organisms for approximately 1 week is inaccurate and contradicts next sentence regarding weathering of aromatic components of oil spills. The analysis needs to be corrected.

4-83 57. p. IV-B-3 Toxic effects of oil are underestimated and based on old studies analysis does not adequately assess sublethal effects of oil on fish.

4-84 58. p. IV-B-4 The sublethal effects of hydrocarbon materials occuring at very low levels is not really recognized in the analysis. The effect on herring eggs in early stages is significant.

4-85 59. p. IV-B-5 Data Gap. sublethal long-term effects of exposure to drilling fluids and cuttings is incomplete.

4-86 60. p. IV-B-8 If a spill occurs tradeoffs will have to be considered. For instance MMS will have to consider the use of dispersants to protect a special coastal resource . ie.) the world population of black brant at Izembek as a tradeoff to toxicity to marine organisms which can repopulate over time.

4-87 61. p. IV-B-9 Seismic tests will likely have a 'negligible effect' as long as explosives are not used.

4-88 62. p. IV-B-10 Effect of a major spill on localized area could effect entire basin. For instance in a smaller area where a year class concentrates. (ie) consider a 200 sq. km slick along the N. Peninsula coast where larval king, tanner crab, herring, pollock and juvinile salmon concentrate.) Further analysis does not explain how 200 sq. km. area. Analysis of offshore oil spills that have occured of the size considered to be worst case in DEIS shows that a much larger area can be affected.

4-89 63. p. P-IV-11 The Analysis is inaccurately portrays the potential hydrocarbon effects on benthic communities. Benthic communities are critical for the fishery resources. Use examples from the N. Sea./Arctic environment.

4-90 64. p. P-IV-14 The analysis underestimates lethal mortality of oil at concentration levels provided.

4-91 65. p. IV-B-15 Discussion on effect of lease sale area. The effect of a 100,000 barrel oil spill covering 200 sq. kilometers may be moderate on the Bering Sea as a whole, however because of temporal and spatial segregation of stocks, some stocks could be decimated.

4-92 66. p. IV-B-15 "A large nearshore spill which resulted in higher concentrations of hydrocarbons contacting estuaries at spawning-run time is unlikely" Why is this statement true and what data is this assumption based on. Spawning salmon could return in late June through September.

4-93 67. .p. IV-B-15 Paragraph two. Although an oil spill.... This paragraph is not considering the worst case. Although MMS has identified that there is a low probability for a pipeline break in Port Moller; if the break were to occur it could be catastrophic as the hydrocarbons would go back and forth with the tides. Again, given certain timing and certain weather conditions the spill could occur during a time which could have a significant effect on an entire specific stock.

4-94 68. p. IV-B-15 The Analysis fails to discuss the effect a potential spill could have on migrating salmon. The analysis suggest delay caused by concentrations of oil at 1 ppm, other studies suggest delay can be caused by .5 ppm regardless, the analysis also fails to discuss the effect of a spill on the reproductive success of migrating salmon. The effect of delay during migration can decrease spawning ability of migrating salmon.

4-95 69. Table IV-15 Note: table suggests that if a spill of 1,000 barrels or greater occurs Port Moller has a conditional probability of 99.5+ for oil to contact Port Moller, this is a very high probability.

4-96 70. p. IV-B-16 Paragraph two alludes to severe local effects, why not just state a moderate to severe local effect is possible?

4-97 71. p. IV-B-17 High probability of contact to Port Moller within 3 days would occur for Alternative I or IV if the spill was a result of a pipeline rupture. The discussion only covers production platform. What about exploration and transshipment of resource.

4-98 72. p. IV-B-17 Paragraph on Izembek/Moffet Lagoons and Bechevin Bay is using poor logic. Parallel logic would be if all the caribou in Alaska are killed, the portion of the world population effected would be small.

4-99 73. p. IV-B-17 Paragraph on Unimak Pass. Analysis fails to include a discussion on probability of spill resulting from tankers instead of Herendeen/Balboa Bay pipeline, or from oil and gas production in Canada, or from other Bering Sea lease areas.

4-100 74. p. IV-B-18 Southern Coast of the Alaska Peninsula. Trajectory analysis for S. side of the Peninsula at Balboa Bay is needed if proposal to build pipeline is serious.

4-101 75. p. IV-B-18 Summary effects on salmonoids. Agree with analysis of minor overall effects on regional populations resulting from lease sale; however localized effects on local populations could be significant if a spill occurs.

4-102 76. p. IV-B-19 First real paragraph. Where is Sea Target 4?

4-103 77. p. IV-B-21 Analysis does not adequately evaluate importance of lethal effects of oil on fishery resources.

4-104 78. p. IV-B-23 Effect on Port Moller. Important point. MMS is confident that Port Moller will be contacted by hydrocarbons. Port Moller is too wide to feasibly exclude the oil by booms. In addition, the tidal action could potentially move the oil back and forth several times in the bay. MMS needs to assess the fate and duration of spilled oil in Port Moller due to tidal action. Further, can the mouth of Port Moller be protected by use of booms if a spill did occur? Finally, the analysis tends to understate the probability by using "reletively" high. 99.5% is very close to "certain to contact".

4-105 79. p. IV-B-33 Data gap. Identification of juvenile king crab habitat along the northern side of the Alaska Peninsula.

4-106 80. p. IV-B-33 NOTE: "Because the coastal zone along the northern side of the Alaska Peninsula is the major reproductive site for the depressed stock of red king crab in the Bering Sea, an oil spill which contacted a nearshore area while vulnerable lifestages were present could have serious effects on the regional population".

81. p. IV-B-34 Note: "potential impact on currently depressed red king crab are recognized as major".

4-107 82. p. IV-B-39 No spill prediction model for S. side a big deficiency when assessing potential impacts.

4-108 83. p. IV-B-40 N. Coast of the Ak. Peninsula. Two points regarding oil spill trajectory. 1. Presence of longshore currents is not a. documented and b. included in the oil spill prediction model. From the discussion this seems significant because of the effect longshore currents have on the conditional spill trajectories. 2. According to the discussion, the contact probabilities "may underestimate" the risk to the lagoons since they do not incorporate spills from ships or occurrence of a spill in the vicinity of a lagoon entrance. This indicates that the spill model has not included all potential spill sites nor has it adequately estimated the extent of the potential effect of an oil spill in the vicinity of the lagoon or bay. In effect this down plays the potential damage of oil spill.

4-109 84. p. IV-B-41 Second real paragraph. "Probability of a 1,000 barrel or greater spill occurring and entering the nearshore zone in the vicinity of N.L/P.M. remains relatively high." This only covers offshore spills, not pipeline rupture nearshore. What is the probability in the event of a rupture near shore?

85. p. IV-B-42 Site Specific Disturbance. Discussion provides support for the AE Aircraft special use policies.

4-110 86. p. IV-B-43 First full paragraph. Identifies relatively low bird densities in areas likely to be traversed by OCS associated helicopters. Experience in 1984 and given the data provided in the previous paragraph this conclusion is inappropriate. Granted bird densities in offshore areas would be low, however any traffic out of Cold Bay would disturb waterfowl, geese, and brant in nearshore and lagoon areas.

4-111 87. p. IV-B-44 Conclusion, Effects on Marine and Coastal Birds. Analysis acknowledegs moderate to major potential effects for AE CRSA. Birds that intensively use limited habitats such as Izembek and Moller/Nelson Lagoon (and for which no alternative habitats are available) are most vulnerable. In addition no evidence is presented which indicates that waterfowl would avoid oiled areas; continuous or repeated contact would be likely.

4-112 88. p. IV-B-48 First full paragraph. Discussion is moot because MMS analysis admits that it takes 10 days or more to deploy cleanup equipment. If oil can't be cleaned up then area can't be excluded from otter's high use area.

89. p. Figure IV-4. Illustrates that Port Moller bears the brunt of potential impacts.

4-113 90. p. IV-B-49 Is there any evidence that walrus will avoid contaminated areas as suggested in the middle of the first paragraph?

4-114 91. p. IV-B-50 Discussion assumes avoidance of contaminated areas and availability of other acceptable haul-out sites; consistently used rookeries and haulout sites by populations must provide some unique characteristics for continuous use.

4-115 92. p. IV-B-50 If disturbance from exploration, development and production extends over many years the cumulative effect could be population reduction or abandonment of habitats near disturbance.

4-116 93. p. IV-B-51 Third real paragraph. How can the Marine Mammals Protection Act and the USFWS implement regulations to help prevent excessive distrubance of ahrbor seals and other marine mammals? Will the USFWS require tankers to stop or reroute during pupping. This requires a stipulation at the lease sale stage.

4-117 94. p. IV-B-56 Biological opinion for endangered species consultation only covers exploration not development and production when disturbance and spill potential are greater.

4-118 95. p. IV-B-56 Second real paragraph. Discussion on effect of seismic testing on gray whales. Discussion requires that seasonal operational restraints will have to be part of development plans, including non-explosive seismic activity.

4-119 96. p. IV-B-59 Discussion of geophysical testing effects on whales is best professional judgement and is not based on hard data.

4-120 97. p. IV-B-87-88 Effects on commercial fishery. 1. Will oil/fish workgroup reduce adverse effects?

Estimated space loss for commercial fishing is one-quarter mile of platforms, pipeline, extended anchoring system for trawlers, or at peak activity 60 square miles. Discussion somewhat contradicts stipulation section which says that pipelines should be constructed and installed to allow gear to pass over without snagging. Further the proposed pipeline route traverses a heavily used commercial fishing area. If the MMS uses the AE CRSA list of priorities as stipulations in the CM plan the impacts should be minimized.

4-121 98. p. IV-V-88 The analysis underestimates the potential impacts of space and catch loss on commercial fishing activities. The analysis misrepresents the perspective the N. Sea commercial fishermen as provided by John Goodlad in the Shetland Islands Conference. In 1984 the Aleutians East CRSA sponsored a workshop on the impact of oil and gas development in the N. Sea. John Goodlad represented the Shetland Island Fishermans Association. Mr. Goodlad shared the opinion of the fishermen that while the fishing and oil industries have had to learn to live together, the Shetland experience has been one of conflict caused by having two users of the seabed with many different aims, methods and purposes. Mr. Goodlad contends that now, over a decade after major production had begun Shetland fishermen are only begining to learn from the mistakes that were made.

The priority problems between the fishing and oil industries identified by Mr. Goodlad are:

a) Safety and navigation - This was a problem initially and resolved satisfactorily for both oil and fish industry.

b) Loss of access to traditional fishing grounds - ongoing problem.

c) Oil related debris - ongoing problem

d) Pollution - ongoing concern

In California similiar problems have been identified by California fishermen.

99. p. IV-B-90 Trawler Gear Damage. During the above mentioned conference Mr. Goodlad was asked about conflicts between pipelines and trawl gear damage. Mr. Goodlad spoke about an early agreement with the oil companies which provided for compensation for snagged gear. The agreement provided that if adequate proof is submitted that the gear was snagged on debris left by a particular oil company, that oil company will compensate the fisherman for the loss.

If debris is not attributable to a particular oil company, but definitely oil-related, claims are submitted to the United Kingdom Offshore Operators Association (UKOOA) compensation plan. This plan is funded by the oil companies and administered by fishermen appointed by the Oil/Fisheries Work Group. The system, which Mr. Goodlad beleives is fairly good, attempts to compensate fishermen for damage to gear and vessels, lost fishing times, etc. But, no matter how good the system is it can never compensate for the full cost of the loss or the inconvenience of an incident.

Another related problem to trawl gear conflicts is more general in nautre. Once an incident occurs in an area fishermen will tend to avoid fishing there in order to prevent another occurrence. A side effect of the oil related debris problem in the N. Sea has been loss of fishing access to fishing grounds on either side of pipelines.

4-122 101. p. IV-B-95 Effect on fisheries on S. Coast of Ak. Peninsula Tanker traffic out of Balboa Bay analysis is inadequate. Balboa Bay is filled with shoals and steep topography route out of the Bay is more hazardous than out of Valdez. Tankers need 1.3 miles to stop. Could this make transshipment more difficult? A spill prediction model is needed and a more detailed discussion of oil transshipment out of Balboa Bay is needed.

4-123 102. p. IV-B-96 If the "effect of OCS oil related employment will be insignificant" does this mean that local residents will not enjoy employment opportunities even during the production stage?

4-124 103. p. IV-B-108 Cold Bay and Unalaska. If the pressure on the resource will be minimal why did ADFG and USFWS consider methods of restricting access to Izembek or limiting harvest of brant to minimize population impacts in 1984?

4-125 104. p. IV-B-109 Will Sand Point be excluded from any economic benefits from the Balboa Bay LNG terminal?

4-126 105. p. IV-B-110 First sentence first paragraph. Does this assume that subsistence fishermen would not be deterred from harvesting tainted fish?

4-127 106. p. IV-B-111 Prior part of DEIS said that segregated ballast and oil tanks would be used, eliminating the need for ballast water treatment.

4-128 107. p. IV-B-113 Where is the assessment of increased sport hunting pressure and harvest on true subsistence users?

4-129 108. p. IV-D-1 Alternative III would also provide time to complete nearshore resource and habitat studies in progress, collect additional meteorological and oceanographic data to improve spill prediction model, provide the AE CRSA Board/Region time to prepare for the lease sale etc.

4-130 109. p. IV-E-1 The deferral alternative would have a significant advantage. With the number and severity of resources and commercial fishing impacts that ride on just this area, this alternative is highly worthwhile. Development of nearshore OCS and state offshore should be delayed until 1) an economic oil resource is verified and 2) industry demonstrates they can operate effectively in the Bering Sea.

110. p. IV-F-2 At a minimum the NPDES conditions should be as stringent as other area drilling activities have been.

4-131 111. p. IV-F-3 "Decomposition and weathering process for oil are slowed appreciably in colder waters". In other words oil in embayments, lagoons, and bays may take years to reduce toxicity.

4-132 112. p. IV-F-6 Is situ burning a preferred alternative by oil companies?

4-133 113. p. IV-F-13 Discussion on LNG plant size at Balboa Bay is not consistent with earlier discussions in DEIS. Other discussions used considerably smaller site (40 hectares) for site and no need for ballast treatment facilities because of use of separated ballast.

4-134 114. p. IV-F-13 First discussion of difficulties of transshipment out of Balboa Bay. 1. Loading of large crude carriers would have to be conducted well out into the Bay. 2. Dimensions of the Bay are such that tanker movements must be closely supervised by tugs. 3. The crash-stop length of a VLCC-ship of 200,000 DWT or larger is nearly 5 kilometers 3.1 miles at 15 knots.

4-135 115. p. IV-F-15 Transportation corridor discussion is not consistent with other parts of DEIS discussion. Corridor will more likely take up 500 acres minimum with construction right of way, material sites, disposal sites, access roads etc., and p. IV-F-13 says that the oil terminal and LNG plant at Balboa Bay would be 150 hectares vs. 20-30 hectares.

4-136 116. p. IV-F-17 Effects of Coastal Management program on Alternative I. The discussion is inappropriate. The Bristol Bay CRSA and the AE CRSA are impact areas. Further the AECRSA plan will apply to more than oil spills. The Plan applies to pipeline routeing, interference with commercial fishing, mining of gravel in anadrmous fish streams near the pipeline route, special use policies on aircraft, drege disposal, water quality, aircraft, barrier island disturbance, blasting, gray whales, and marine mammal habitats. The Public Hearing Draft of the AE Coastal Managment Plan has been out for review since February 1, 1985 the DEIS discussion should address the public hearing draft policies. The policies do not prohibit activities however performance standards are established as well as timing of certain activities:

4-137 117. p. IV-F-18 The entire nearshore area is subject to the AECRSA Plan and the entire nearshore area is estuarine in the coastal managment plan.

4-138 118. p. IV-F-19 The Corps. Section 404 permits permits should be individual for the special use areas identified in the AE Coastal Managment Plan.

4-139 119. p. IV-F-20 Standards for Facility Siting. Analysis only keys on Yukon/Kuskokwim CRSA, AE policies need to be applied here.

4-140 120. p. IV-F-21 First mention of causeway in Herendeen Bay. The effects of a causeway on Herendeen Bay need to be discussed. A causeway would alter bay circulation, productive tide flats etc. Fish passage will also be a concern for any fish stream crossing pipeline access roads, or work pads.

4-141 121. p. IV-F-21 Second paragraph. The transportation corridor is not north of the major caribou-migration path it is simply between subherds.

4-142 122. p. IV-F-21 The Bristol Bay Study Group did not specify which valley was more appropriate for the transportaion corridor. Much more investigation will have to be conducted to determine the best route.

4-143 123. p. IV-F-24 More time is needed so that at least the AE CMP is formally approved by the Department of Commerce. The current shedule is for the AE Plan to be adopted by the Alaska CPC September or October 1985 and the Department of Commerce December 1985 or January 1986.

4-144 124. p. IV-F-24 Alternative IV Ak. Pen. Deferral. Text indicates that gray whale spring migration is within 3 km of the coastline. Why is deferral of lease tracts helpful here? Gray whales would still be suseptible to an oil spill nearshore - logic is inconsistent with data.

125. p. IV-F-25 The analysis needs to recognize the high potential for attracting brown bears to garbage and the need to
4-145 require bear-proof fencing of facilities during construction and operation. Killing of bears in defense of life and property should not be the only alternative considered.

126. p. IV-F-26 Local population of brown bears could be
4-146 significantly affected by exclusion from use of spring forage and fish stream feeding areas, den abandonment along pipeline corridors and human/bear incidents.

127. p. IV-G-1 (a) Fisheries resources, unavoidable adverse effects. Unavoidable oil spill effects will be extremely difficult to mitigate because of long oil spill response time and weather conditions. The technology to clean up oil spills in the Bering Sea is not yet available.

128. p. IV-G-1 (b) Marine and coastal birds, unavoidable
4-147 adverse impacts. Aircraft disturbance can be mitigated with flight path and altitude restrictions, see AE Special Use policies for aircraft flight restrictions.

129. p. IV-I-1 Irreversible and Irretrievable Commitment of Resources. Economic Resources: If pipeline and subsea struc-
4-148 tures that prevent trawl fishing are not removed at project completion, long term loss of commercial fishing opportunities could result.

130. p. IV-J-7 MMS should construct a worst case scenario of pipeline rupture between drill platform and Port Moller during July-September for a 100,000 barrel spill and determine the effect on 1. Juvenile and marine fish, 2. larval and adult
4-149 crab, juvenile and adult marine fish, seabirds, waterfowl, marine mammals, commercial fishing opportunities, contaminated coastline and nearshore, oil in Nelson Lagoon, Herendeen Bay, Port Moller, tideflats and wetlands, and bad weather, onshore winds, and low visibility.

Response 4-1a

The data gaps on fisheries that were indentified by the Alaska Department of Fish and Game and the United Fishermen of Alaska (UFA) are responded to in detail in the Responses to Letter 1 (State of Alaska) and Letter 6 (United Fishermen of Alaska).

Response 4-1b

The EIS is organized by species groups. The analysis of effects on each species group includes a discussion of important habitats used by groups. All five Special Use Areas identified by the Aleutians East CRSA Board are covered in these discussions.

The Information to Lessees (ITL) on Coastal Zone Management acknowledges that policies in the Alaska Coastal Zone Management Program may be relevant to exploration, development, and production activities. The ITL on Areas of Special Biological Sensitivity has been amended to include the five Special Use Areas recommended by the Aleutians East CRSA Board.

Response 4-2

This concern is addressed in Response 3-2.

Response 4-3

There is insufficient history of development on the federal OCS in Alaska on which to base any statistical evaluation of oil-spill probability and differentiate it from all federal OCS experience; therefore, all OCS-wide data are used. As discussed in Section IV.A.3.b., the use of Alaskan oil-spill data--rather than nation-wide data--would result in fewer (but not significantly fewer) projected numbers of oil spills in the analysis. Thus, the use of Alaskan data would lower the apparent risk from oil spills, not increase it.

The oil-spill-risk analysis and the resulting probabilities assume that commercial quantities of oil will be found in the North Aleutian Basin and also everywhere else in the Bering Sea and the Canadian Beaufort Sea. The probabilities do not take into account the low probability of an economic oil find in the North Aleutian or the extremely small likelihood that commercial finds would be made in all areas.

Response 4-4

The EIS does consider earthquakes and other related phenomena. Section III.A.1. of the EIS describes the environmental geology of the region, including earthquakes and other related hazards. Section IV.A.5. of the EIS (Constraints) briefly describes

significant natural hazards that could act as constraints on oil and gas development.

Response 4-5

The area that could be covered by a spill depends on the characteristics of the crude oil and water temperature. Based on these parameters, a spill could spread to a thickness of less than 1 millimeter to a few millimeters (ABSORB, 1980; Thorsteinson, 1984). A 100,000-barrel spill could cover up to 20 square kilometers; however, slicks from instantaneous spills at sea are generally discontinuous and may spread over a tenfold greater area than indicated by slick thickness and mass. Based on this, a 100,000-barrel spill could be expected to cover 200 square kilometers, but only 10 percent of the water surface would be covered by oil.

Discussion of the toxic effect of hydrocarbons on fish eggs and larvae, sublethal effects of hydrocarbons, and the effect of hydrocarbons on benthic organisms has been expanded (Sec. IV.B.1.a.(1) of the FEIS).

Response 4-6

This concern is addressed in Response 3-2. In addition, further discussion of fate and persistence of spilled oil in the North Aleutian Basin has been added to the text (Sec. IV.A.3.e. of the FEIS).

Response 4-7

No tanker traffic is postulated for the Port Moller area as a result of the Sale 92 proposal or the cumulative case. Industry-supply vessels are expected to be based out of Unalaska, not Port Moller. The vessels and supply ships identified in the EIS are fishing vessels, and fishing-industry and local community-supply vessels.

The likelihood of oil-spill contact is discussed in the oil-spill-risk analysis. Launch Point D1 is a hypothetical pipeline (and platform) point of spillage within Resource Area 7, an oil-spill-risk-analysis target covering offshore waters and shoreline near Port Moller/Herendeen Bay. The probabilities of contact with this target are given in Appendix G. The likelihood of shoreline contact is given in Appendix G and also is discussed in Section IV.A.3.c. The effects of oil-spill contact are discussed for individual resources in Sections IV.B. through IV.F. under the proposal, and for the alternatives under the individual resource categories.

Response 4-8

The analysis for fisheries resources is based on the definitions presented in Table S-1; these definitions focus on regional populations rather than local stocks. Based on these definitions, minor to moderate effects on regional populations of fisheries resources could be expected; however, serious localized effects could occur on localized stocks, which constitute a portion of the regional populations. The analysis evaluates the potential effects in the event that a spill contacts a nearshore area. However, based on combined probabilities, this appears unlikely. The analysis further assumes that vulnerable lifestages would be present when a spill contacted the nearshore area.

Response 4-9

Based on the study of coastal currents and tidal action, oil spilled offshore in any volume has a low probability of entry into Nelson Lagoon. Presumably, should a pipeline break occur, shutdown would prevent the loss of large volumes of oil that could affect fisheries resources or the commercial fishery.

Response 4-10

This concern is addressed in Response 1-21.

Response 4-11

The EIS provides an analysis of the effects of a 100,000-barrel spill on the fisheries resources concentrated in the Port Moller area. Although the probability of a 100,000-barrel spill occurring and contacting the Port Moller area appears unlikely, the EIS evaluates the effects of an oil spill of this magnitude on nearshore areas (i.e., Port Moller). Because the analysis assumes that the oil spill would contact the nearshore area, the source is irrelevant.

Response 4-12

The pipeline-transportation scenario for the proposal is based on pipelines that will transport hydrocarbons from offshore platforms to terminal facilities at Balboa Bay. It is anticipated that the onshore pipelines will cross the Alaska Peninsula between Port Moller and Balboa Bay. The Port Moller/Balboa Bay transpeninsula-corridor route was selected for analysis because it was identified as a transportation route in the following land-use plans: The Bristol Bay Area Plan for State Lands (State of Alaska, 1984); the Bristol Bay Regional Management Plan (BBRMP, 1985); and the Draft Alaska Peninsula National Wildlife Refuge Comprehensive Conservation Plan (USDOI, FWS, 1984). The route identified in

Figure II-2 is only a general route; a specific route could be identified only after site-specific studies are conducted.

At this time, the MMS feels that it is premature to identify specific pipeline routes or any specific structures, such as a causeway, that could be associated with pipeline construction. Specific pipeline routes would be analyzed in a development EIS based on plans submitted by industry. In the event that pipelines or associated facilities were sited in Special Use Areas identified by the Final Aleutians East Coastal Management Plan, such facilities would have to be consistent with that plan.

Response 4-13

Examples of transshipment difficulties are cited in Section IV.F.5. of the EIS.

Response 4-14

The oil-spill-risk analysis for the proposal is provided for the southern side of the Alaska Peninsula in Section IV.A.3.c. The cumulative analysis no longer postulates that oil from other sales would be transshipped at Balboa Bay. The analysis for the proposal discusses potential spills from tankers leaving Balboa Bay but does not provide a trajectory analysis of at-sea tanker spills south of Balboa Bay. A generic discussion of tanker routes from the Bering Sea to market was provided in the Sale 70 FEIS as Appendix I, and this discussion is incorporated herein and in Section IV.A.3.c. by reference. In summary, Bering Sea oil finds are expected to supplement Prudhoe Bay crude deliveries to the U.S. West Coast, Gulf Coast, and East Coast. Note that the 28-percent chance of at least 1 at-sea tanker spill of 1,000 barrels or greater south of Balboa Bay (discussed in Sec. IV.A.3.c.) is for the entire tanker route, which extends for thousands of kilometers south of Balboa Bay, perhaps all of the way to the U.S. East Coast. There is a 72-percent chance that no such tanker spill would occur. The likelihood that such a spill would occur anywhere near the southern side of the Alaskan Peninsula is much less than the chance of such a tanker spill occurring along the tanker route.

Balboa Bay lies outside of both the North Aleutian Basin and the boundaries of the Chukchi/Bering Sea regional-oil-spill model used by the MMS. There is no equivalent model available for the southern side of the Alaska Peninsula. Transportation scenarios are very tenuous because transportation routing depends on how much and exactly where oil is found--if it is found. A detailed analysis of transportation alternatives is more appropriately left to a developmental EIS, when the "if," "where," and "how much" would be known.

A trajectory model for the southern side of the Alaska Peninsula is under development for use in analysis of the proposed Shumagin

Basin (Sale 86). Tankering of North Aleutian Basin oil would be considered as part of the cumulative case for proposed Sale 86. The oil-spill-risk analysis assumes that half of the projected at-sea tanker spillage would occur within the model area--the Bering and Chukchi Seas. However, the lengths of tanker routes outside the model area are much greater than their lengths within the model area, potentially extending as far as the U.S. East Coast. Thus, the MMS is overestimating, rather than underestimating, the at-sea risk of spills from tankers within the model area.

An offshore-loading scenario for oil in the proposed Sale 92 area has been added to the oil-spill-risk and effects analyses in the FEIS.

Response 4-15

The oil-spill-trajectory model uses all relevant and available data sources. The model was originally developed and constructed for Bristol Bay use, and the MMS has confidence in its validity. The referenced but unidentified concerns of the UFA are discussed in specific responses to concerns raised in Letter 6 (from the UFA).

Response 4-16

Mechanical spill-cleanup equipment would not be effective in 20- to 25-foot waves. However, waves of 20 feet or more occur only about 1 percent of the time in the North Aleutian Basin (Marine Area C in Brower et al., 1977). Under such conditions, chemical or natural dispersion would be more effective than mechanical cleanup equipment (see Fig. IV-7).

Response 4-17

Section IV.B.1.a.(1) (Oil-Spill Effects) describes the numerous sublethal effects that have been documented in fish and marine invertebrates, and gives examples, where available, of low-level concentrations resulting in these effects (i.e., 10 to 100 parts per billion [ppb] [Sondheimer and Simeone, 1970; Todd et al., 1972], and 25 ppb on herring reproductive success [Malins, 1980]. Many of the hydrocarbon concentrations cited in the literature, however, are LC_{50} values, which are distinguished more easily, but do not represent the lower limits of the concentrations that cause sublethal effects.

The sublethal effects of low-level concentrations of hydrocarbons also are recognized in the analysis. The sublethal effects of contact with low-level hydrocarbon concentrations and lethal effects, are acknowledged in Section IV.B.1.a.(1), and are considered in the assessment of aggregate lethal and sublethal effects on fisheries resources and in the overall conclusion.

Response 4-18

The report entitled "Evaluation of Bering Sea Crude Oil Transportation Systems" (Han Padron Associates, 1984) states that (1) the characteristics of crude oil to be produced, (2) the quantity recoverable, (3) the initial productivity, and (4) the optimum rate of recovery may influence the selection of the optimum transportation system. The report indicates that no data are available to predict the quality of oil that may be found in the Bering Sea lease sale areas. In light of this lack of data, the Han Padron report assumes, for purposes of the study, that Bering Sea oil would have properties similar to Cook Inlet crude oil. Based on the properties of Cook Inlet crude oil, the study concludes that a long marine pipeline would not be feasible.

It must be remembered that no data are available on the properties of Bering Sea lease-sale-area oil. It is probable that potential North Aleutian Basin crude oil has properties different from those of Cook Inlet crude. Until a discovery is made and its exact properties are determined, it is not prudent to dismiss pipelines as a transportation alternative. However, an analysis of offshore loading as a transportation alternative for the proposal (Alternative I) has been included in the FEIS (see Sec. II.B.2.)

Response 4-19

The text in Section IV.B.1.b.(1) of the FEIS has been amended to address this concern.

Response 4-20

The trackline miles of seismic surveys needed for siting platforms and pipelines are calculated on the basis of surveys required for similar offshore construction in other areas. It is not anticipated that North Aleutian Basin requirements will exceed these comparable miles of seismic surveys.

Response 4-21

Section IV.F.5.b.(2) has been rewritten to reflect the recent distribution of the draft Aleutians East Coastal Management Plan (CMP).

Response 4-22

The MMS feels that Stipulation No. 2 (Orientation Program) provides for an adequate presentation on commercial fisheries. The stipulation states, ". . . and shall include information concerning avoidance of conflicts with commercial fishing operations and with commercial fishing gear." The stipulation has been amended (Sec. II.C.1.b. of the FEIS) to include a presentation on lease sale stipulations and ITL provisions (see Response 1-23).

Response 4-23

Stipulation No. 3 (Protection of Biological Resources) is designed to mitigate adverse effects on biological resources only on OCS lands over which the MMS has jurisdiction. The MMS does not have the authority to develop measures to mitigate effects on state or private lands or lands under the jurisdiction of other federal agencies.

In response to this concern, the following Special-Use Areas have been added to the ITL on Areas of Special Biological Sensitivity (Sec. II.C.1.b. of the FEIS):

(1) Port Moller/Herendeen Bay
(2) Nelson Lagoon
(3) Izembek Lagoon
(4) Bechevin Bay
(5) Unimak Pass

Response 4-24

The state and local CRSA's have the opportunity to review exploration, development, and production plans and pipeline right-of-way applications for consistency with the Alaska Coastal Management Program (ACMP) pursuant to Section 307(c)(3)(B) of the Coastal Zone Management Act (CZMA). Because the CZMA provides the state and the Aleutians East CRSA the authority (once its plan is approved) to review industry plans through the consistency-review process, there is no need to include a statement in the stipulation indicating that the RSFO should consult with the Aleutians East CRSA regarding proposed pipelines. The ITL on Coastal Zone Management advises the lessees of the ACMP and the consistency-review process.

Response 4-25

This concern is addressed in Response 4-24.

Response 4-26

This concern is addressed in Response 4-18.

Response 4-27

In the absence of documentation for these comments, the MMS must utilize available information as contained in "Proceedings of a Synthesis Meeting: The North Aleutian Shelf Environment and Possible Consequences of Offshore Oil and Gas Development, Anchorage, Alaska, March 9-11, 1982." At this meeting, participants representing several academic disciplines involved in the mechanics of oil spills utilized oil-spill-trajectory analyses developed as models by Liu and Leendertse (1979, 1981a, 1982) to determine the

maximum surface area encompassed by an oil spill of 200,000 barrels of Prudhoe Bay crude oil. It was calculated that this volume would affect 168 km^2 after 5 days, with potentially lethal hydrocarbon concentrations (greater than 0.01 ppm) covering a maximum area of 407 km^2 during the highly biologically active month of June.

There is some variability in measurements of toxicity of petroleum hydrocarbons; toxic effects lasting up to 8 months would be possible only if the initial high concentrations were confined in a very limited area without much ability to disperse.

Response 4-28

The Section IV analysis of community infrastructure and Table S-1 (Summary of Effects) are based on the basic assumptions for effects assessment--that 364 MMbbls would be produced from the North Aleutian Basin lease sale area. Based on the analysis in the EIS, the effects on the community infrastructure of Cold Bay and Unalaska resulting from OCS-generated-population increases would be negligible. The OCS-generated-population would be very minimal and would not place a burden on the existing infrastructure of Unalaska or Cold Bay (Sec. IV.B.1.b.(3) of the FEIS).

Response 4-29

The first of two concerns states that vessel-traffic effects on Unimak Pass would not be minor if an offshore-loading scenario were utilized to develop the resources of the proposed action. The utilization of an offshore-loading scenario, which is analyzed as a transportation option under the proposal (see Sec. II.B.2), would result in an additional 60 tanker transits through Unimak Pass during the peak years of production (1995-2000). During the late 1990's, it is estimated that large-vessel traffic transiting Unimak Pass would be in excess of 1,000 trips per year. It is doubtful that traffic generated by the proposal would constitute more than 5 percent of that total. The effect of this level of tanker transportation is considered minor.

The second concern states that, should all forecasted Bering Sea hydrocarbons be produced and transported to market through Unimak Pass, the traffic levels could be significant. The MMS agrees; it is probable that, in this case, the U.S. Coast Guard would establish a vessel-traffic-separation system. The USCG has studied such a system for Unimak Pass and concluded that a traffic-separation scheme was not warranted at this time.

Response 4-30

Studies are done before, during, and after a lease sale. Most of the studies funded by the MMS are planned to be completed before an FEIS is prepared so that the information can be incorporated in the

FEIS. However, there are often continuing needs for new information, especially as new research methods are developed. Results from ongoing or future studies will be used in developmental-stage EIS's and in permitting, and are also useful in monitoring the effects of OCS activities, should development occur.

Response 4-31

The text has been amended to reflect this concern (see Sec.I.D.1. of the FEIS).

Response 4-32

This concern is addressed in Response 4-12.

Response 4-33

The MMS agrees that the ultimate effect of an oil spill may depend, in part, on industry's ability to contain and clean up oil spills. Because the success of oil-spill response is highly variable and depends on many conditions, the EIS takes a conservative approach to oil-spill analysis and does not assume that cleanup would be accomplished. Most major oil spills are neither totally contained or cleaned up but dispersed naturally.

Response 4-34

In prior seismic-survey efforts in the North Aleutian Basin, explosives were not used as seismic-energy sources. High-resolution surveys used either a sparker or j-boomer as a sound source, while deep-seismic surveys used an array of airguns. In addition, sleeve exploders and waterguns were listed on some North Aleutian Basin permits. Based on the anticipated seismic activity and the past history of seismic surveys in the basin, the use of explosive seismic-energy sources is not anticipated. Industry may request the use of explosive-energy sources under special conditions; however, their use would be evaluated on a case-by-case basis in subsequent environmental assessments. Application for permits in state waters would have to be consistent with the Alaska Coastal Management Program and the Aleutians East Coastal Management Plan.

Response 4-35

This concern is addressed in Response 4-18.

Response 4-36

Table IV-2 (Estimated Schedule of Development and Production for Alternative I) of the EIS indicates that an oil pipeline would be constructed in 1992 and 1993, while a gas pipeline would be constructed in 1993 and 1994.

Response 4-37

As indicated in Section IV.A.1.d.(Development and Production Infrastructure Estimates), the LNG facility at Balboa Bay would be cooled by air, rather than water.

Response 4-38

This concern is addressed in Response 1-22.

Response 4-39

This concern is addressed in Responses 2-1 and 2-2.

Response 4-40

Stipulation No. 2 (Orientation Program) has been modified to include a presentation on lease sale stipulations and ITL provisions (also see Response 1-23).

Response 4-41

In response to this concern, the following Special-Use Areas have been added to the ITL on Areas of Special Biological Sensitivity (see Sec. II.C.1.b. of the FEIS):

(1) Port Moller
(2) Herendeen Bay
(3) Nelson Lagoon Bay
(4) Izembek Lagoon
(5) Bechevin Bay
(6) Unimak Pass

As indicated in Section II.C.1.c. (Information to Lessees), these measures either advise or inform the lessees of existing legal requirements. In most cases, ITL's carry no specific enforcement authority by the Department of the Interior (USDOI). USDOI's authority extends only to operations actually conducted on the leasehold. Regardless of the USDOI's enforcement authority, the ITL on Potential Gear Conflict with the Commercial Fishing Industry provides a positive mitigation by creating greater awareness of this special concern.

Response 4-42

The ITL on Coastal Zone Management advises lessees of the importance of the coastal districts in reviewing development and production plans and pipeline right-of-way applications. Early consultation with coastal districts is encouraged. The Aleutians East CRSA is listed as one of the coastal districts with which these discussions should be held (also see Response 4-24).

Response 4-43

The concern that the Aleutian East CRSA Board be included in decisions that affect its coastal zone is discussed in Responses 4-24, 4-25, and 4-42.

Response 4-44

The MMS encourages early consulation; however, it is beyond the authority of the Department of the Interior to require consultation or to designate a time for CRSA's to give a formal presentation. However, the ITL on Coastal Zone Management does point out why it behooves lessees to contact coastal districts early in the lessee's decisionmaking process.

Response 4-45

As indicated in Section II.C.1.c., the purpose of the ITL on Areas of Special Biological Sensitivity is to provide recognition of important wildlife-concentration areas to be considered in oil-spill-contingency planning. The ITL on Potential Gear Conflict with the Commercial Fishing Industry addresses this concern for potential fishing-gear conflicts.

Response 4-46

The draft policies of the Aleutians East CRSA Board only partially use the same distances as those in the ITL on Bird and Marine Mammal Protection. To the extent that final policies and this ITL use the same standards, they are mutually reinforcing. Although the ITL on Bird and Marine Mammal Protection does not list as special areas all of the places designated by the Aleutians East CRSA Board, those places are included indirectly through the ITL on Areas of Special Biological Sensitivity, which advises lessees that CRSA Boards may have additional areas defined as having special biological sensitivity (also see Response 4-41).

Response 4-47

This concern is addressed in Response 4-41.

Response 4-48

Although the two referenced ITL's could be combined into one, the ITL's address separate concerns in the NMFS biological opinion, which discusses measures to protect endangered whales. The ITL on Bird and Marine Mammal Protection provides guidelines for lessees' conduct (which includes tankering) during all activities resulting from this lease.

Response 4-49

The ITL on Potential Gear Conflict with Commercial Fishing Industry is strictly advisory and carries no specific enforcement authority by the USDOI. The MMS feels that it is inappropriate to include language in this ITL that indicates that industry must take a specific action.

The Aleutians East CRSA requested that the following language be added to the ITL: "For those activities that are within or those activities that directly affect the Aleutians East Coastal Zone, all activities shall be consistent with the Aleutians East Coastal Management Plan." This language is not necessary in the ITL on Potential Gear Conflict with Commercial Fishing Industry; the ITL on Coastal Zone Management advises the lessees of the Alaska Coastal Management Program and the consistency-review program.

Response 4-50

The MMS has not proposed an ITL concerning Biological Resources. Sensitive populations and habitats have been included in the ITL concerning Areas of Special Biological Sensitivity (see Response 4-23).

Response 4-51

We agree that the ultimate effect of an oil spill is dependent, in part, on industry's ability to contain and clean up oil spills as well as weathering and natural dispersion. Because the success of oil-spill response is highly variable and depends on many conditions, the EIS takes a conservative approach to oil-spill analysis and does not include cleanup. The paragraphs in question indicate that oil-spill cleanup potentially could reduce oil-spill effects. These paragraphs indicate that the effectiveness of oil-spill cleanup and the protection of sensitive areas is largely dependent on favorable weather conditions.

Response 4-52

Notices to Lessees and Operators (NTL's) and lease stipulations are directed toward the mitigation of effects over which the MMS has enforcement authority through the Regional Supervisor, Field Operations. ITL's inform lessees of existing legal requirements; but in most cases, the USDOI (MMS) has no specific enforcement authority for ITL's.

Response 4-53

The text has been amended to reflect this concern (see Sec. II.C.1.d. of the FEIS).

Response 4-54

As indicated in Section II.C.1.c. (Information to Lessees), ITL's either advise or inform the lessees of existing legal requirements. In most cases, ITL's carry no specific enforcement authority by the Department of the Interior. The ITL on Potential Gear Conflict with Commercial Fishing Industry provides a positive mitigation by creating greater awareness of this special concern.

Response 4-55

This concern is addressed in Response 4-8.

Response 4-56

Table II-2 does mention important harbor seal pupping and haulout areas at Port Moller, Izembek Lagoon, and Port Heiden. However, in response to this concern, Nelson Lagoon and Bechevin Bay were added to the table.

Response 4-57

The summary section (Table II-2) of this EIS reads as follows, "Loss of harvest through foreclosure of fishing areas by offshore facilities (platforms and pipelines) . . ."

Response 4-58

See Response 4-18 concerning the suggestion that a pipeline may not be feasible based on MMS Report No. 110 (Han Padron, 1984). Offshore loading has been analyzed as a hydrocarbon-transportation option under Alternative I (Sec. IV.B.2. of the FEIS).

Response 4-59

The text has been amended to reflect the concerns of the Aleutians East CRSA regarding oil intake by brown bears from contaminated coastal areas or oil-killed marine mammals on fish (Sec. IV.F.6. of the FEIS); however, the conclusions in Table II-2 do not vary from those stated in the DEIS.

Response 4-60

The text in Section III.C.1. of the FEIS has been amended to remove the claim that sockeye salmon runs are higher in odd years than in even years.

Response 4-61

The Balboa Bay area and surrounding Alaska Peninsula National Wildlife Refuge are designated as PSD (Prevention of Significant

Deterioration) Class II Areas. The allowable increment amount of air-pollution concentrations above background levels for Class II areas is given in Table III-44.

Response 4-62

Information provided by the commentor has been used to update the description of the Aleutians CRSA Coastal Management Plan and the Bristol Bay CRSA Coastal Management Plan (see Sec. IV.F.5.b.).

Response 4-63

This concern is addressed in Response 4-18.

Response 4-64

Because of the uncertainty in calculating the amount of formation waters produced from production wells, a range of amounts has been given. This uncertainty will exist until wells have been drilled in the sale area and precise estimates can be made on the amount of formation waters produced.

Response 4-65

The text has been amended to indicate that the pipeline right-of-way could range from 100 to 200 feet (Sec. IV.A.4.d. of the FEIS).

Response 4-66

As indicated in Section IV.A.1.d. (Development- and Production-Infrastructure Estimates), the LNG plant at Balboa Bay would be cooled by air rather than water.

Response 4-67

Small spills (less than 1,000 barrels) are not counted in the trajectory analysis of spills of 1,000 barrels or greater. Numbers and sizes of such small spills are projected and considered as part of chronic spillage in Section IV.F.1. (Water Quality). This point has been clarified in Section IV.A.3.b. (Probability of Oil Spills Occurring) of the FEIS.

Response 4-68

The mean resource is 364 MMbbls, and projected spillage is 36.4 percent of the number of spills per billion barrels of produced and/or transported oil in Table IV-6. Note that projected platform and pipeline spills would occur within Bristol Bay and are tabulated for the proposal in Table IV-8. Tanker port-call and at-sea spills would occur south of the Alaska Peninsula and are tabulated separately in Table IV-10.

Response 4-69

Table IV-7 presents data for both Cook Inlet and Prudhoe Bay/Kuparuk tankering. Although Cook Inlet may be a relatively open tanker route, Prudhoe Bay/Kuparuk oil is transported to Valdez, where it must then be tankered past Valdez's constricted passages and submerged rocks. Substitution of either Cook Inlet or Valdez tanker statistics in the analysis of proposed Sale 92 would result in less projected spillage.

Note also that the statistics used in the EIS assume a significant likelihood of spills per port call. Counting both loading and unloading port calls, port spills account for 31 percent of tanker spills of 1,000 barrels or greater. Such spills of 1,000 barrels or greater are not caused by loading and unloading misadventures, but rather result predominantly from groundings and collisions within the restricted and congested waters of ports. Thus, the analysis does include consideration of restricted tanker access to the loading port.

Response 4-70

The resource estimates for Alternative IV have been revised since the publication of the DEIS. The revised estimate shows that Alternative IV has somewhat less oil than the proposal, therefore, fewer projected spills.

Response 4-71

The stochastic weather submodel used by Rand does simulate local wind roses on a seasonal basis and reproduces the long-term weather record when run stochastically for a sufficient length of time. The tidal portion of the model was designed originally and specifically for Bristol Bay, is considered state-of-the-art (Pearson et al., 1981; Huang and Monastero, 1982), and has successfully predicted locations of previously unidentified tidal nodes. The Outer Continental Shelf Environmental Assessment Program of the National Oceanic and Atmospheric Administration uses the Rand model as a tool to identify the best locations to collect physical oceanographic data (see Response 4-14).

Oceanic and Atmospheric Administration uses the Rand model as a tool to identify the best locations to collect physical oceanographic data (see Response 4-14).

Response 4-72

The text has been clarified to reflect this concern (Sec. IV.A.3.c. of the FEIS). For this analysis, three time periods were selected: 3 days--to represent diminished toxicity of the spill; 10 days--during which time spill cleanup could be a mitigating factor; and 30 days--to represent the difficulty of tracking or locating spills after this time.

Response 4-73

A combined probability is converted directly from a "combined" spill number via the Poisson distribution (a statistical device). The "combined" spill number is calculated as the sum of the products of a number of projected spills occurring at each hypothetical launch point times the fraction of trajectories from that launch point that reach a specific target or land/boundary segment.

For proposed Sale 92, the resulting combined probabilities are low because (1) the likelihood of having spills is relatively low--there is a 39-percent chance that no spills of 1,000 barrels or greater would occur, and (2) a single spill has only limited size and duration; it can only contact some places, and not every place, in Bristol Bay.

The analysis projects a 61-percent chance of 1 or more spills of 1,000 barrels or greater over the 26-year life of the field. The southern Bering Sea experiences a spill of such magnitude about every 3 years from fishing-industry or community-supply vessels. For example, a community-supply barge, the *Cornell Barge No. 10*, sank in Kuskokwim Bay north of the proposed lease area in the summer of 1982, resulting in the release of 2,190 barrels of fuel (Oil Spill Intelligence Report, 1982). In November 1979, the fishing vessel *Ryuyo Maru* grounded in the Pribilofs, resulting in the release of 6,900 barrels of fuel (Reiter, 1981). Neither of these spills--both of fuel, which is generally more toxic and water-soluble than crude oil--resulted in anything other than short-term, local effects.

The toxic fractions of crude oil are generally those lower in molecular weight and, therefore, both more soluble in water and more rapidly evaporated. Most of the toxic component is lost from a slick within hours of a spill; the 3 days used to represent the loss of this component is an overestimate in this EIS.

If the effects on a resource are caused by toxicity of the water-soluble component of the oil, the EIS analyst uses 3-day trajectories. If the effects on a resource are caused by physical contact with the slick, the MMS uses longer trajectories.

Response 4-74

Real oil slicks can very seldom be tracked for more than about 10 days before the oil becomes too dispersed to locate or identify as a slick (USDOI, MMS, 1983). For example, the tanker *Alvenus* spill of 54,000 barrels in the Gulf of Mexico in August 1984 could not be located or identified as a slick 10 days after the spill (Oil Spill Intelligence Report, 1984). No slick was ever identified or located following the tanker *Cepheus* grounding in Anchorage harbor, which resulted in a spill of 5,000 barrels of fuel in January 1984. In Kuskokwim Bay, north of the proposed lease sale area, the sinking of the *Cornell Barge No. 10* resulted in the release of 2,190 barrels of oil over a 3-week period. The observed slick extended no more than 1 kilometer from the barge (Oil Spill Intelligence Report, 1982), indicating a slick life of no more than a few hours.

Because of these and other case histories, the MMS does not presume to model trajectories for more than 30 days. Note that the EIS, however, does consider the fate and behavior of oil after 30 days (i.e., see Fig. IV-3).

Response 4-75

Table V-1 summarizes the characteristics of Prudhoe Bay and Cook Inlet crudes in relation to two other standard crudes. Both Cook Inlet and Prudhoe Bay crudes are intermediate in gravity, with similar viscosities and pour points. These similarities indicate that the spreading behavior of these two crudes should be similar over the water-temperature ranges found in the Bering Sea. Prudhoe Bay crude contains twice as much asphalt as Cook Inlet crude. The asphalt component of crude is very resistant to weathering. Thus, weathering rates for Cook Inlet crude would be more rapid than those cited in this EIS for Prudhoe Bay crude. High nickel, vanadium, and sulfur content, such as Prudhoe Bay crude has, indicates a tendency to form mousse--a water-in-oil emulsion, which is difficult to clean up and which retards natural dispersion of the oil. The aromatic content of an oil is an indication of its toxicity. Prudhoe Bay crude and Cook Inlet crude have similar and fairly large aromatic fractions (Payne, 1981).

Response 4-76

The text has been clarified and expanded to reflect this concern (Sec. IV.A.3.d. of the FEIS).

Response 4-77

The MMS has no authority to require industry to form a North Aleutian Basin Cost Participation Area (CPA). Spill-response cooperatives have been established by industry for each Alaskan OCS oil and gas lease sale, following the sale. CPA's cannot be formed before a lease sale because "cost participation" requires knowledge of the post-sale exploration activity of each participant. Obviously, such knowledge cannot predate the sale. The MMS, however, anticipates that industry will form or expand an existing CPA to cover the proposed sale area because CPA's generally provide both a more effective and a more cost-effective spill-response capability; that is, CPA's are better and cheaper than going it alone.

Response 4-78

Further discussion on the effectiveness of cleanup equipment as a function of sea state has been added to the text (Sec. IV.A.4. of the FEIS) (also see Response 4-16).

Alaska OCS Order No. 7 (issued in accordance with 30 CFR 250.43) requires that oil-spill-contingency plans contain provisions for identifying and protecting areas of special biological sensitivity. Such plans must be approved by the MMS before exploratory drilling can occur. The MMS agrees with the Aleutians East CRSA that this requirement can provide significant protection to sensitive areas. The MMS will provide the Aleutians East CRSA (once finally approved) and the State of Alaska with review copies of exploration plans (including oil-spill-contingency plans) for the proposed lease sale area during the 30-day comment period for such plans.

Response 4-79

Table IV-8 reflects tankering of Canadian oil from the eastern Beaufort Sea.

Response 4-80

The St. George Basin (Sale 70) is included in the cumulative analysis for this EIS. Proposed State of Alaska Sale 56 is an upland sale and would contribute no spillage to the North Aleutian Basin. Proposed Shumagin Basin (Sale 86) is on the southern side of the Alaska Peninsula, outside of the model area, and would not contribute spillage to the North Aleutian Basin. Sale 86 is currently scheduled to occur in December 1987, 2 years after proposed Sale 92. This EIS considers all appropriate OCS oil and gas sales in the 5-year leasing schedule.

If Sale 86 had been considered as part of the cumulative case south of the Alaska Peninsula, the chance of 1 or more spills occurring between the southern side of the Alaska Peninsula and market would have increased by about 11 percent.

Table V-1
Gross Characterizations of Four Selected Whole Crude Oils

Crude Oil	API Gravity	Specific Gravity g/ml	Viscosity (100°F) Kinematic cST	Viscosity (100°F) Saybolt sec	Pour Point °F	% Asphalt	Ni ppm	V ppm	S %	N %
Murban, Abu Dhabi	40.5	0.829	2.8	35.9	-20	7	3.0	9.9	0.96	0.10
Cook Inlet, Alaska	35.4	0.848	17	85	-15	12	1.3	0.47	0.09	0.11
Prudhoe Bay, Alaska	27.0	0.893	19	84	-10	23	13.5	28.3	0.98	0.27
Wilmington, California	19.4	0.938	100	470	5	24	100	80.6	1.8	0.83

Source: Payne, 1981.

API = American Petroleum Institute
g/ml = grams per milliliter
cST = centistokes
sec = seconds
ppm = parts per million
% = percent
Ni = Nickel
V = Vanadium
S = Sulfur
N = Nitrogen

Response 4-81

As indicated in Section II.B., there are many development and transportation scenarios that could be selected for analysis. The scenarios developed for EIS purposes evolve based on state-of-the-art technology, potential developments of technology, and the economics of developing the resource. Development and transportation scenarios are continually being modified to fit the latter parameters, as is the case with Balboa Bay. For EIS purposes, the transportation scenario for the proposal uses a transshipment terminal at Balboa Bay. Currently, industry has not proposed any development for the Balboa Bay area. The cumulative-case transportation scenario of the FEIS has been modified from that in the DEIS. In the FEIS, oil from Bering Sea sales other than Sale 92 would be shipped by tanker through Unimak Pass directly to markets rather than being transshipped to a terminal at Balboa Bay. In the cumulative case, oil from Sale 92 would continue to use Balboa Bay as a transshipment-terminal site.

Response 4-82

Oil on the water surface is generally acknowledged to remain toxic to organisms for approximately a week, depending on water temperature (as stated in the EIS). An example specific to the southeastern Bering Sea (which has relatively cold water temperatures and consequently less rapid weathering) is then presented in the EIS.

Response 4-83

Section IV.B.1.a.(1) (General Discussion of Oil-Spill Effects) summarizes current, available information on the lethal and sublethal effects of hydrocarbons on fish and marine invertebrates. This section provides effects information for use in the analysis that follows.

Response 4-84

This concern is addressed in Response 4-17.

Response 4-85

The analysis of effects of drilling fluids and cuttings is based on current, available information. Many sublethal effects have been documented, as summarized by the National Research Council (1983):

> Responses to sublethal concentrations of drilling fluids that have been measured include alterations in burrowing behavior and chemosensory responses in lobsters; patterns of embryological or larval development or behavior in several species of shrimp, crabs, lobsters, sand dollars,

> and fish; feeding in larval and adult lobsters and cancer crabs; food assimilation and growth efficiency in opossum shrimp; growth and skeletal deposition in corals, scallops, oysters, and mussels; respiration and nitrogen excretion rates in corals and mussels; byssal thread formation in mussels; tissue enzyme activity in crustaceans; gill histopathology in shrimp and salmon fry; tissue-free amino acid ratios in corals and oysters; and polyp retraction, mucus hypersecretion, ability to clean surfaces, photosynthesis, extrusion of zooanthellae and survival of corals.

We agree that the knowledge of long-term sublethal effects is limited.

Response 4-86

The discussion of dispersant effects acknowledges that "Chemical dispersion of oil has both advantages and disadvantages which must be weighed in a specific situation. The comparison of trade-offs is not between the effects of dispersed oil and no oil, but rather between the effects of dispersed oil and undispersed oil." The discussion also addresses both the ecological advantages and disadvantages of chemical dispersion (see Sec. IV.A.4.d.).

Response 4-87

As stated in Section IV.B.1.a.(1) (Geophysical [Seismic] Survey Effects) airguns have been the preferred energy source for marine surveys since the 1960's. Airguns are expected to be used in the North Aleutian Basin and to produce negligible effects on fisheries resources. The MMS does not expect explosives to be used.

Response 4-88

An analysis of the effects of a major oil spill on areas where vulnerable lifestages are concentrated is presented in the site-specific analysis for each species group in Section IV.B.1.a. A discussion on the spreading of an oil spill to cover 200 square kilometers is included in Section IV.A.3.d. and Response 4-5. Based on conditions in the North Aleutian Basin, a 100,000-barrel oil spill is not expected to cover more than 200 square kilometers.

Response 4-89

The analysis of potential hydrocarbon effects on benthic communities is based on information on sedimentation of oil and possible effects on benthic biota from available sources through 1984, as summarized in the EIS. The MMS believes that the analysis is accurate. An example from the North Sea environment (Ward et al., 1980) has been incorporated in the FEIS (Sec. IV.B.1.a.(1)).

V-102

Response 4-90

The text has been amended to address this concern (Sec. IV.B.1.a.(1)) of the FEIS).

Response 4-91

The text acknowledges that serious effects could occur on fisheries resources in localized areas. The overall conclusion considers these localized effects in the context of regional populations.

Response 4-92

This statement is based on the probabilities of an oil spill of 1,000 barrels or greater occurring and subsequently contacting nearshore areas (Sec. IV.B.1.a.(1)).

Response 4-93

This concern is addressed in Response 4-11.

Response 4-94

The analysis summarizes available information on detection and avoidance of hydrocarbons by salmon and evaluates possible delays or diversions in spawning migrations. The analysis does not suggest that ". . . delay caused by concentrations of oil at 1 ppm . . ." would occur, but rather that "Hydrocarbon concentrations in open-water areas are usually less than 1 ppm; such concentrations should not divert or delay migrating salmon." The concern over effects on the reproductive success of salmon has been addressed in Section IV.B.1.a.(1) of the FEIS.

Response 4-95

The conditional probability of a 1,000-barrel-or-greater oil spill contacting Port Moller is greater than 99.5 percent from Spill Point D1. The conditional probability, however, represents the probability of oil contacting the area if an oil spill occurred. In assessing the potential effects of the proposal, final (combined) probabilities provide a more accurate assessment of the oil-spill risk to resources because they represent the probability of an oil spill occurring as a result of the proposal and subsequently contacting a given area. Combined probabilities for Port Moller range from 17 to 27 percent for 3, 10, and 30 days following an oil spill, depending on the transportation scenario.

Response 4-96

The EIS acknowledges that serious localized effects could occur; however, the overall conclusions are based on regional, rather than localized, populations.

Response 4-97

The probabilities of oil-spill contact with Port Moller could result from a well blowout, a pipeline rupture, or a tanker spill. Accidents associated with the transshipment of oil out of Balboa Bay would not affect Port Moller.

Response 4-98

This concern is addressed in Response 4-8.

Response 4-99

An analysis of the effect of offshore loading on fisheries resources has been included in the FEIS (Sec. IV.B.1.a.(1)). The potential effects of spills resulting from tankering from Canada or other lease areas north of the North Aleutian Basin are addressed in the cumulative-effects section of that analysis.

Response 4-100

This concern is addressed in Response 4-14.

Response 4-101

Potential localized effects on salmon resources have been acknowledged to be greater than the minor effect assessed on regional populations throughout the analysis and in the summary and conclusion of Section IV.B.1.a.(1).

Response 4-102

Sea Target 4 is at the entrance to Izembek Lagoon, as stated in the Section IV.B.1.a.(1).

Response 4-103

This portion of the analysis states that 100-percent mortality of herring embryos could occur as a result of contact with hydrocarbons following an oil spill.

Response 4-104

The text has been clarified (Sec. IV.B.1.a.(1) of the FEIS) regarding the likelihood of oil-spill contact (also see Response 3-2).

About 6,000 feet of boom are currently stored by the St. George Basin Cost Participation Area (CPA) at Dutch Harbor (Table IV-9) and could be flown to Port Moller within 2.5 hours in case of a spill. Additional boom is usually kept on drilling or supply vessels during exploration (see Table IV-10). Rather than attempt to completely close off Port Moller with a boom, it is more likely that the choice would be made to use booms either to divert the oil away from Port Moller or to divert the oil onto another coastal area.

The diversion approach could be very advantageous. By diverting the oil into an area, more valuable nearby areas are protected; and the oil can be contained and recovered. An example of this approach would be to use booms to divert oil out of the main tidal channel into the protected area behind Moller Spit. The oil would be contained by booms against the beach--a limited portion of Moller Spit. The oil pooling in this area could be recovered by skimmers or suction pumps. Shoreline contact would be limited to a portion of the exposed tidal flats behind Moller Spit (see Michel et al., 1982) (also see Response 4-78).

A discussion of oil persistence on the types of shoreline found in the Port Moller area and elsewhere in Bristol Bay has been added to the text (Sec. IV.A.3.e. of the FEIS).

Response 4-105

This concern is addressed in Response 1-3.

Response 4-106

The statement quoted by the commentor was taken verbatim from the DEIS; no response is needed.

Response 4-107

This concern is addressed in Response 4-14. Until a spill-trajectory model is available for the southern side of the Alaska Peninsula, a conservative approach is used in the analysis, which assumes that potential effects occur if oil is spilled rather than placing greater emphasis on the probability of occurrence, as is possible elsewhere.

Response 4-108

Statements that may have led to confusion regarding the types of information incorporated into the oil-spill-risk-analysis model have been amended to reflect the appropriate interpretation (see Sec. IV.B.1.a.(2) of the FEIS). Section IV.B.2.a.(2) provides an analysis of the effects of an offshore-loading-transportation scenario on marine and coastal birds.

Response 4-109

This concern is addressed in the amended paragraphs preceding the cited statement (see Sec. IV.B.1.a.(2) of the FEIS). The probability of oil entering lagoons along the Alaska Peninsula from a pipeline break (i.e., the Port Moller area is the only projected

nearshore pipeline) would depend on the amount of oil released, distance from shore, relation to lagoon entrances, current direction and velocity between release point and lagoons, wind direction and velocity, sea state, phase of the tidal cycle, and effectiveness of any containment procedures employed. Obviously, the likelihood of entry into a lagoon would increase as the release site approached lagoon entrances; and this probability would be further enhanced as unfavorable states of the above variables impinged on the released oil (i.e., strong onshore wind, weak longshore current, flooding tide, etc.). Beyond a few miles offshore, it is likely that coastal currents would divert most or all of any released oil parallel to the peninsula or northward. The probability of 1 or more spills of 1,000 barrels or greater occurring somewhere along pipelines associated with this sale area over the life of the field is 0.44. The probability of a pipeline break occurring at any specific point would be difficult to calculate at this time.

Response 4-110

This section of the analysis deals only with potential disturbance effects on birds in pelagic areas, not with levels of disturbance that may occur in nearshore and lagoon areas during the initial portion of, i.e., a helicopter trip from Cold Bay to an offshore rig. This latter topic is addressed in Response 1-16 and in amended Section IV.B.1.a.(2) of the FEIS.

Response 4-111

There is some evidence available (Custer and Albers, 1980) that at least one species of waterfowl tends to avoid oil. The text has been amended to reflect this concern (see Sec. IV.B.1.a.(2) of the FEIS).

Response 4-112

This discussion is not moot; in calculating the probabilities that oil spills would contact sea otter concentration areas, the MMS does not assume that an oil spill would be cleaned up. The analysis in Section IV.B.1.c. of the DEIS on site-specific effects of oil spills on sea otters assumes that an oil spill does contact a sea otter high-use area. An ITL on Oil-Spill-Contingency Plans has been incorporated into the FEIS (Sec II.C.1.b.(2)).

Response 4-113

The analysis in Section IV.B.1.c. of the DEIS does not suggest that walrus would actively avoid "contaminated areas," but rather states that walrus can easily move to unaffected areas if the clam resource in the contaminated area (which is likely to be a small portion of the available benthos) were reduced as a result of an oil spill. The analysis cites Fay and Lowry (1981) as evidence that walrus can easily move from an area of reduced benthic food items to other areas of abundant benthos.

Response 4-114

The DEIS states that sea lions and harbor seals may be displaced from haulout sites or rookeries if they are contaminated. In this discussion of a potential tanker spill on the southern side of the Alaska Peninsula, sea lion rookeries are far to the west of the likely tanker route from Balboa Bay, and contamination of these rookeries is likely to be minimal if contact occurs. Displacement is likely to be temporary, no more than one season or year, with the sea lions returning to the sites after the oil is weathered and dispersed. Haulout areas nearer to Balboa Bay and the tanker-transportation route are more likely to be contaminated if a tanker spill occurred; however, displacement of sea lions or harbor seals from these sites also is likely to be temporary, with the sea lions and seals returning to the sites probably within 30 days after the spill is dispersed and weathered.

Response 4-115

Disturbance of pinnipeds and other marine mammals from aircraft and vessel traffic associated with oil and gas activities over the life of the field are not likely to result in a population reduction or permanent abandonment of a significant amount of habitat area sufficient to cause a population decline unless rookeries are frequently disturbed to the point that pup mortality increases over and above natural mortality levels for a period of several years.

Marine mammal populations along the California coast, such as those of the California sea lion, Steller's sea lion, harbor seal, and elephant seal, have greatly increased in the past 10 to 15 years coincidental to the cumulative increases in air and vessel traffic as well as oil exploration and development. Disturbance of marine mammals associated with this development has had no apparent adverse effect on these populations that would result in a population decline. Therefore, the same species (harbor seal and Steller sea lion) are not likely to suffer population declines in the lease area or other coastal areas in Alaska from noise and disturbance associated with cumulative oil and gas exploration and development and production.

Response 4-116

The U.S. Fish and Wildlife Service (FWS) has management jurisdiction over sea otters, walrus, and polar bears. The National Marine Fisheries Service (NMFS) manages fur seals, sea lions, other seals, and whales and dolphins. The NMFS or FWS Service would not have to stop or reroute oil tankers during the pupping season because the tanker routes would not pass near enough to rookeries to cause any

disturbance of pupping activities. The NMFS or FWS can enforce the Marine Mammal Protection Act (MMPA) if OCS air and boat traffic disturb the seal rookeries by declaring that the air- or boat-charter companies are in violation of the MMPA because such disturbance of marine mammals consitutes harassment or "taking of marine mammals" under the Act, which would require a permit from the NMFS. The oil companies and their subcontractors (air-charter companies, etc.) would then need a permit to take or disturb marine mammals. The ITL on Bird and Mammal Protection should not be a stipulation on the lessees because MMS has no legal authority to regulate air traffic, which is regulated by the FAA.

Response 4-117

As stated in the biological opinion ". . . consultation must be reinitiated before development and production activities occur in the area." Therefore, consultation will occur before the development/production EIS is completed.

Response 4-118

The Regional Supervisor, Field Operations (RSFO), will determine if operational restraints are necessary for development during the review process of developmental plans under the appropriate ITL and NTL to implement the reasonable and prudent alternatives set forth in the NMFS's biological opinion. All current seismic activity uses nonexplosive technology. As stated in Section I.D.2.c., "Based on the anticipated seismic activity and past history of seismic surveys in the basin, the use of explosive seismic energy sources is not anticipated."

Response 4-119

The estimation of effects of seismic testing on whales is based on a review of all current data. An EIS analyst then prepares a professional judgment that incorporates the conclusions and hypotheses from the data base. The MMS has prepared a worst-case analysis to consider effects of seismic activities on gray and right whales (Sec. IV.J.).

Response 4-120

We believe that the somewhat synonymous terms (coordination/communication/cooperation) applied to the interaction between the oil and fishing industries will do much to reduce, perhaps even eliminate, the adverse effects that could occur. A good example is Chevron's recent exploratory drilling in the more restricted confines of Shelikof Strait during the 1984-85 crab fishery without loss or damage to the commercial fishing industry (Kodiak Daily Mirror, March 21, 1985).

Response 4-121

A considerable portion of the proposed lease-sale area is only lightly fished during the year by foreign fishermen, and currently for only limited periods by domestic fishermen, during the short seasons for halibut and crab. A fair, approximate appraisal relative to space and catch loss to the commercial fishing industry would be to assess the effects of the recently completed COST/ exploration wells that were drilled in the St. George and Navarin Basins (the former is more heavily fished). We are unaware of any conflicts between these projects and the operation of commercial fisheries in these areas. With development, the total number of platforms (2) and kilometers of offshore pipeline (190) would be an insignificant increment of insignificant effect on commercial fishing.

Response 4-122

An oil-spill analysis for the southern side of the Alaska Peninsula for the proposal and cumulative case are included in the text in Section IV.A.3.b. and IV.A.6.b., respectively. The oil-spill analysis was used in evaluating the effects on fisheries as well as other biological resources.

Oil-spill-trajectory simulations are not available for the southern side of the Alaska Peninsula (this concern is addressed in Response 4-14). Lacking an oil-spill-trajectory simulation, a conservative approach to environmental analysis was taken by assuming that a tanker oil spill would occur along the potential tanker route (Fig. II-2) and contact biological resources adjacent to the tanker route. The oil-spill analysis was then used to given an indication of contact probability.

A discussion on the limitations of tankering in Balboa Bay is presented in Section IV.F.4. of the EIS.

Response 4-123

Local residents would have every opportunity to enjoy employment opportunities provided by the oil industry. The EIS implies that, due to the large labor markets outside the local area, both the fishing and oil industries should not have any problem securing employees to meet operational needs.

Response 4-124

The analysis deals in future time, with the effects on subsistence-use patterns assumed to be demonstrated by the newly inmigrant OCS-related residents of Cold Bay. The description of the community (Sec. III.C.4.) establishes that there is no deep subsistence tradition existing in Cold Bay. New inmigrants, presumed to

represent the values of the dominant society, are assumed to be similarly oriented and inclined toward other-than-subsistence practices and traditions. Consequently, this is the basis for concluding that there would likely be minimal pressure on the resources of the area from subsistence-based activities. This is not to say, however, that negative effects could not be realized on specific resources from other forms of predation, i.e., most notably from sport hunting. Izembek Lagoon is an international mecca for waterfowl hunters, primarily because geese and other fowl stop there to feed for several weeks during spring and fall migrations. The regulatory measures cited may have been established to protect the threatened Pacific black brant, a major user of Izembek Lagoon eelgrass-food resources, especially during the fall southern migration.

Response 4-125

Sand Point is not considered to be excluded from the potential economic benefits of the Balboa Bay LNG terminal. Section IV.B.1.b.(5) (Sociocultural Systems) contains a discussion of potentially beneficial social and political effects on the City of Sand Point, including ". . . capturing the terminal . . ." for tax-base purposes, and other effects from factors associated with a terminal--new or expanded service industries and U.S. Coast Guard housing.

Response 4-126

The assumption was made that subsistence fishermen would not be deterred from harvesting tainted fish. It also was assumed that subsistence fishermen would harvest potentially tainted fish to meet subsistence needs, which might be increased with a temporary income shortfall from commercial fishing. The effects of tainting or the fear of tainting are seen not as a function of the inability of fishermen (commercial or subsistence) to catch fish but of the inability to market the product, or as a function of the processing sector of the commercial fishing industry. Such would not be the case with the subsistence fishery.

Response 4-127

The text has been changed to reflect this concern (see Sec. IV.B.1.b.(4) of the FEIS).

Response 4-128

The non-OCS-forecast case in Section III.C.4. (Future of the Environment without the Proposal), which is included in the cumulative effects discussion in Section IV.B.2.d. of the DEIS, cites the competition for moose and caribou as the basis for a potential reduction in average household-harvest rates in the Bristol Bay region as a whole. This increased competition is seen as generally derived from resident-population growth with no attempt to differentiate "true subsistence users" from others.

Response 4-129

The benefits of Alternative III are indicated in Section IV.D.1. (Effects on Biological Resources) and in Section IV.F.5.b.(2) (Effects on Coastal Management).

Response 4-130

(1) The Alaska Peninsula Deferral (Alternative IV) does not include the nearshore area, which was previously removed from the Sale 92 area. The area offered in this alternative is more than 40 kilometers offshore.

(2) Economic resources cannot be verified until exploration activities have been conducted. Delaying the sale would not accomplish this goal.

Response 4-131

The text has been amended to include a statement concerning the biodegradation of oil in Bering Sea waters (Sec. IV.F.1.a. of the FEIS).

Response 4-132

Site burning is one method of removing spilled oil from the environment. The effectiveness of oil-spill cleanup at sea is detailed in Section IV.A.4.e. of the FEIS.

Response 4-133

The transportation scenario for the cumulative case has been modified in the FEIS (see Sec. IV.A.6.b.). In the cumulative case, oil from OCS Bering Sea sales other than Sale 92 would be tankered through Unimak Pass directly to markets rather than to a transshipment terminal at Balboa Bay. Sale 92 production would be transported to a terminal at Balboa Bay. The text has been modified in Section IV.A. to indicate that the LNG plant would require about 80 hectares for the proposal. In the cumulative case, the LNG facility also would require about 80 hectares, since only North Aleutian Basin gas resources would be transported to the facility.

Response 4-134

This concern is addressed in Response 4-13.

Response 4-135

The text has been modified to indicate that about 500 acres could be visually impaired by construction of the transportation corridor (Sec. IV.F.5.a.(1) of the FEIS). The 25- to 30-hectare area refers to the acreage required by a terminal that would process only North Aleutian Basin (Sale 92) oil. The reference to a 150-acre terminal has been deleted because of the change in the cumulative-transportation scenario for the Sale 92 FEIS.

Response 4-136

The analysis of effects in the DEIS with respect to the Alaska Coastal Management Program (ACMP) concentrates on those policies that are in effect prior to publication of the EIS. Subsequent to the publication of the Sale 92 DEIS, the Aleutians East CRSA published its CMP Public Hearing Draft, and the Bristol Bay CRSA CMP was adopted by the Alaska Coastal Policy Council. In neither instance have the programs been incorporated into the ACMP by the Office of Ocean and Coastal Resources, U.S. Department of Commerce.

As noted in Section III.D.5., the Bristol Bay CRSA's plan has policies that relate directly to oil and gas activities. However, none of the effects related to activities hypothesized in this EIS have occurred within that coastal district; almost all occur within the Aleutians East CRSA, an area for which only draft policies are available. Because the specific language used in draft policies is subject to change, these policies are not reviewed individually. Rather, the overall policy emphasis is discussed in the introduction to Section IV.F.5.b., where it is noted that the proposed policies typically do not preclude development but provide standards for performance and restrictions on timing. Specific policy analysis remains focused on state policies. This is appropriate not only because these are the only enforceable policies for the Aleutians East area, but also because new policies formulated by coastal districts usually supplement those of the state, rather than replace them. The ITL on Coastal Zone Management has been revised to inform lessees of the state's Bristol Bay Area Plan (1984).

Response 4-137

The estuarine designation for the entire nearshore area of the Aleutians East CRSA has been noted in Section IV.F.5.b. of the FEIS.

Response 4-138

Permits issued by the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act are issued individually unless an activity falls under a category covered by a national permit. None of the hypothesized activities appear to fall into that category.

Response 4-139

As noted in Response 4-136, specific policies of the Aleutians East CRSA program are not assessed because they are still in draft form. However, in the overall assessment in the introduction to Section IV.F.5.b. of the EIS, the Aleutians East CRSA policies for facility siting are discussed. An ITL also refers to these policies.

Response 4-140

This concern is addressed in Response 4-12.

Response 4-141

The referenced statement in the DEIS is ". . . the pipelines are north of the major caribou migration path and calving area of the southern subherd." To eliminate the potential for misinterpretation, the words "of the major caribou migration path and calving area" have not been used in Section IV.F.5.b.(1) of the FEIS.

Response 4-142

The reference in the DEIS to the Bristol Bay Study Group referred to a study for the suitability of the Portage Valley (the valley assumed for the pipeline corridor in the DEIS) for wilderness designation. This sentence has been deleted. References in Section IV.F.5.b.(1) of the FEIS focus on the corridors identified by the Bristol Bay Area Plan for State Lands and include no further elaboration.

Response 4-143

Section IV.F.5.b.(2) has been rewritten to reflect the recent distribution of the Draft Aleutians East Coastal Management Plan.

Response 4-144

As stated in Section IV.F.5.b., biological conclusions are those reached in the respective analysis sections. For gray whales, the conclusion for Alternative IV (Alaska Peninsula Deferral) is the same as for the proposal, although the deferral does provide extra time for oil-spill cleanup crews (see clarification in Sec. IV.F.5.b.(2) of the FEIS).

Response 4-145

The text has been amended to reflect the need to keep bear/human interaction to a minimum (Sec. IV.F.6.a. of the FEIS).

Response 4-146

Since only a small proportion of even local bear populations would potentially be affected, the effects are concluded to be minor, as stated in the DEIS.

Response 4-147

Some aircraft disturbance of waterfowl at Izembek Lagoon is unavoidable. Under IFR conditions, aircraft must use the IFR flight path over the lagoon. Regarding potential mitigating flight patterns under VFR conditions, the Federal Aviation Administration, which promulgates flight regulations, has not sanctioned new flight paths or altitudes.

Response 4-148

Pipelines and other subsea structures would have little, if any, effect on commercial-fishing gear and would comprise only an insignificant addition to the already natural obstructions to trawl and other fishing gear.

Response 4-149

The FEIS contains an analysis of a worst-case scenario that includes a 100,000-barrel platform spill at Spill Point B3 (Sec. IV.J.3.) (see Graphic 5). A 100,000-barrel pipeline spill between a drilling platform and Port Moller was considered. However, due to the estimated volume of oil resources and the maximum anticipated yearly production, it was determined that this quantity of oil could not technically be spilled because in-line flow sensors would detect the spill and shut off the pipeline flow.

5

BP Alaska Exploration Inc.

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JOHN R. GRUNDON
President

March 8, 1985

RECEIVED
MAR 15 1985
REGIONAL DIRECTOR, ALASKA OCS
Minerals Management Service
ANCHORAGE, ALASKA

Mr. Alan D. Powers
Regional Director
Minerals Management Service
P. O. Box 101159
Anchorage, Alaska 99510

RE: N. Aleutian Basin - OCS #92
Comments on Draft Environmental Impact Statement

Dear Mr. Powers:

We have reviewed the Draft Environmental Impact Statement for the North Aleutian Basin and would like to offer the following comments for your consideration.

BPAE consider the North Aleutian Basin to be one of the most important exploration prospects among the remaining frontier areas offshore Alaska. We strongly recommend that the OCS #92 lease sale be held as scheduled, and that the sale area consist of all blocks as proposed in Alternative I of the DEIS.

BPAE recognize the concern of the commercial fishing community and the environmental organizations for the resources of the area. However, we believe the oil industry has proved, both offshore Alaska and around the world, that it has the technology to operate in an environmentally sound manner in areas very similar to the North Aleutian Basin. The testimony of the Alaska Oil and Gas Association at the Anchorage public hearing on February 26th addressed these issues in detail and we fully endorse the statements made in that testimony.

Thank you for the opportunity to express our comments on this important OCS area.

Yours sincerely,

John Grundon

J. R. Grundon

SD/JRG/mew

6

UNITED FISHERMEN OF ALASKA

Cass M. Parsons
Executive Director

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March 15, 1985

RECEIVED
MAR 15 1985
REGIONAL DIRECTOR, ALASKA OCS
Minerals Management Service
ANCHORAGE, ALASKA

Mr. Alan Powers
Regional Director
Minerals Management Service
Alaska OCS Region
P.O. Box 101159
Anchorage, AK 99510

Dear Mr. Powers:

Attached are the comments of the United Fishermen of Alaska (UFA) on the draft Environmental Impact Statement for OCS Lease Sale #92 North Aleutian Basin.

As you know, UFA is extremely concerned about the effects of offshore petroleum development on the region's commercial fisheries. In reviewing this document, UFA has found serious deficiencies concerning the oilspill model, as well as the impacts to fisheries and other resources. In addition, we have identified significant gaps in the current information regarding the assessment of impacts of offshore petroleum development activities on the Bristol Bay region. (These finding will be provided to you under separate cover.) Based on our findings we strongly urge that this lease sale be delayed ten years.

We hope you find these comments useful.

Sincerely,

Cass Parsons

Cass M. Parsons
Executive Director
United Fishermen of Alaska

III. Comments on DEIS Section IV.B.1.
Impacts to Marine and Coastal Birds (part b.) and
Marine Mammals (parts c, d, and e).

In reviewing the sections of the DEIS which describe birds and marine mammals, habitat supporting these species, and possible impacts to either the species or their habitat which could result from this lease sale, we found numerous inconsistencies in impacts assessment and deficiencies in the information on which these assessments were based. The following comments highlight our findings.

A. Marine and Coastal Birds (DEIS at IV-B-36)

6-1 The DEIS was misleading in its presentation of the overall possible impacts to marine and coastal birds. Table S-1, Summary of Effects for Alternatives, lists the overall impact for marine and coastal birds as MODERATE. However, footnote #3 admits that "if a spill were to enter the area surrounding a major seabird nesting area in the Shumagin Islands or a heavily used waterfowl staging area (Izembek or Nelson Lagoons) in spring or fall, MAJOR effects could result." Considering that the locations described in the footnote are also the areas with the highest probability of contact with an oilspill, that the period of high risk constitutes a large portion of the probable drilling season, and that recovery from a spill could require 20-50 years (III-B-37), it is unreasonable to relegate this observation to a footnote.

6-2 The potential effectiveness of mitigating-measures is misleading and in part unfounded. Nonenforceable Information to Lessees (ITL) which may or may not result in a lessee taking unspecified, voluntary actions to reduce impacts cannot appropriately be credited for lessening potential impacts as is done on pages II-C-7 - II-C-10 or for reducing the category of impacts as is done on page II-C-13. The ITL's dealing with Areas of Special Biological Sensitivity and Bird and Marine Mammal Protection should instead be incorporated into Stipulations with effective, enforceable requirements for protecting these resources.

6-3 Even when Stipulations are in place, they cannot be credited or relied upon to reduce impacts. Disregard for Stipulation #3 of St. George Basin Sale #89 regarding harassment of wildlife has resulted in repeated disturbance of staging geese in Izembek Lagoon (Anchorage Times, October 10, 1985). Support aircraft which were supposed to avoid these vulnerable wildlife concentrations repeatedly flew too closely to the area, disturbing the birds during a critical feeding enforcement period. Incidents such as these point out the need for stronger enforcement of lease sale stipulations. However, it also points out that operators may tend to disregard environmental safeguards even when they are part of required stipulations. In this case, the only way to insure that impacts to the unique and irreplacebale resources which are at risk are mitigated is to delete sensitive areas from lease sales. Surely an area which boasts "several of Alaska's most important seabird nesting and waterfowl/shorebird staging areas" (III-B-19) with 4.5 million nesting birds in the vicinity of the lease area, pipeline corridor, or tanker traffic (IV-B-30) merits predictable measures of protection. Stipulations should at a minimum provide for avoidance of harassment of wildlife, stationing of oilspill cleanup equipment full time at sensitive areas such as Izembek and Nelson Lagoons, and preparations for diverting birds from spills or rescuing flightless birds.

6-4 Various sections describing impacts were incomplete. These omissions tend to underplay the overall potential impacts of the lease sale. Critical habitat areas listed on III-B-23 should include both Unimak Pass and the Shumagin Islands with a description of their importance. The Proceedings of a Synthesis Meeting, The St. George Basin Environment and Possible Consequences of Planned Offshore Oil and Gas Development, 1981, reported that Unimak Pass and the lagoons on the north side of the Alaska Peninsula were areas of highest concern. Specifically, it stated, "Oilspills in Unimak Pass or in the lagoons would be major disasters" (p. 106) and spilled oil in these areas "could cause major damage to North American bird populations" (p. 108).

6-5 No evaluation is made of the effects of construction and operation of the onshore pipeline on nesting and migrating birds. This oversight should be corrected. In addition to the areas already evaluated, Unimak Pass should be included in the section outlining the site specific effects of oil spills. Impacts resulting from dredging should be included as they were for marine mammals.

6-6 Certain statements in the DEIS require further explanation. For example, page IV-B-44 in the section dealing with cumulative impacts states that "most waterfowl and shorebirds are highly migratory and thus are likely to migrate through, overwinter in, or nest near other state and federal lease areas". However, no explanation is given of how this would tend to affect impacts. In another example on page IV-B-45, the DEIS states, "Chronic exposure to oil in the environment, together with other substantial sources of effects noted above [cumulative effects], is likely to have the most significant long-term effect on bird populations." Again, no explanation is given of what these "effects" are or how serious they might be. Since this lease sale is not an isolated development, special attention should be given to specifically evaluating the cumulative impacts. Broad, vague statements about the trends of various effects cannot be accepted in lieu of specific information or predictions of potential impacts.

6-7 Certain areas of impacts lack quantitative evidence. This makes it difficult to porperly assess the extent of impacts likely to occur. The effects of oil ingestion is not well understood. Due to the region's short food chains and the importance of the area's lagoons as rare food bases, it is critical that more be known about the effects of oil on the lagoon systems and other food sources in the area. These should be considered when considering impacts to birds in the area.

B. Marine Mammals (DEIS at IV-B-46)

General Comments: As in the sections on marine and coastal birds, the DEIS miscontrues the potential dependable effects of the ITL's in mitigating impacts. Since the ITL's merely offer information and do not require any specific mitigating actions or performance standards, they cannot be reasonably expected to significantly alter impacts. Again, we recommend that the ITL on Bird and Marine Mammal Protection be incorporated into a Stipulation with specific requirements for safeguarding these biological resources. We make the same recommendation for ITL on Endangered Whales. The lease area and adjacent waters and coast provide unique marine mammal habitats critical to major portions of many marine mammal species' populations. Many of the most important habitats are at extremely high risk of contact with oil in the case of an oilspill. (Unimak Pass, the major migratory passageway for all species migrating between the Pacific Ocean and the Bering Sea, and Port Moller, a prime feeding area for gray whales, haul out area for seals and walrus, and an important area for sea otters, both have a greater than 99.5% probability of contact.) Responsible planning demands that reliable, mandatory protections be an integral part of any leases or development permits for the area.

It is difficult to assess how categories defining degrees of impact were determined in view of the many unanswered questions on the effects of oil production and its associated activities and the effects of oilspills on marine mammals. Page IV-B-79 describes the direct and indirect effects of hydrocarbon pollution. Instances are cited of possible effects of oil on baleen, respiratory systems, skin, prey, olfactory systems and bonding; and behavioral changes. Questions are also raised on the effects of noise on echo location abilities. Insufficient information is given on these topics to draw responsible conclusions on their impacts. When possible, the best available quantitative data on these impacts should be presented. If no suitable data is known to be available, this should be noted to allow the reviewer to better assess difficulties in determining degrees of impact.

Many statements in the DEIS lack substantiating evidence. For example, on page IV-B-80 the DEIS states, "Feeding behavior may be altered to avoid an oil slick, and/or the availability of prey may temporarily change...therefore, the probability that consequences from interaction between spills and nonendangered cetaceans would occur is unlikely." The ability of cetaceans to
6-8 avoid spills, regardless of their endangered or nonendangered status, is unresolved. Reports of cetaceans traveling or feeding in oil slicks should be included (Geraco and St. Aubin, 1982). Without justification for the assertion that cetaceans may avoid oil, the conclusion that interaction is unlikely is invalid. On page IV-B-82, the DEIS first notes that beluga whales avoided boats at distances up to 2.5 km. In the following sentence the DEIS states, "Nonendangered cetaceans may not be particularly sensitive to many types of noise associated with offshore oil and gas operations." These two observations are contradictory.

Again, the DEIS needs to give specific, scientific, evidence of its assertions if they are to be considered valid. Also, on page IV-B-82, the DEIS maintains that marine disposal of drilling muds, formation and cooling waters; facility siting; dredging and filling; secondary development; and seismic exploration will not
6-9 have a major influence. No evidence is given supporting these conclusions for any of these categories of impacts. At least one of these conclusions is contradicted earlier in the DEIS. Page IV-B-60 describes how dredging in the grey whale calving area of Laguna Guerroro Negro resulted in a decline of calving (Consiglieri and Braham).

Specific Comments on IV.B.1. Impacts to Marine Mammals (parts c, d, and e).

P. IV-B-46. The DEIS tends to downplay the impact of oilspills on non-cetacean marine mammals. For example, the DEIS indicates that, because of their "numerical insignificance...in the lease area," the spotted, ringed, bearded, and ribbon seals need not be considered any further (III-B-23). That is not correct. On the average, they may be uncommon in the lease area, because they occur there only part of the time, when the pack ice is there. The ice extends into the lease area only in years of greater than
6-10 average extent of ice. At that time, any of those species can be there with it in significant numbers, as shown by Braham et al. (1984). Spotted seals in particular can be very abundant. They are most likely to occur there with the ice in March and April, which is the time of birth and nurture of their pups. This is, they occur there in the very habitat in which a spill would be most difficult to control or clean up, and at the very time in their annual cycle when their pups are most vulnerable and most likely to be affected directly by oiling and/or disturbance (Fay, per. comm.).

The DEIS also fails to take into account the recent differences in the status and trends of various pinniped populations. Both the northern fur seal and Steller sea lion have been declining for several years. Therefore, even relatively small effects
6-11 could further affect recruitment rates or increase mortality rates, accelerating the ongoing population decline or delaying recovery. It is conceivable that more than a generation could be required to recover from such effects. The DEIS needs to reflect this information.

On p. IV-B-47 the DEIS indicates that fur seals would not be seriously affected by oil contamination. This is inaccurate; oiling of fur seals could cause death through hypothermia or ingestion. This is particularly important because of the lease sale's proximity to major fur seal migration areas and the Probilof Islands. Virtually the entire Pribilof Island
6-12 population of northern fur seals, including nursing females, feed and migrate in waters to the west of the proposed sale area. If a large spill were to move through this corridor over a period of several days or weeks during fur seals' summer breeding season or the spring and fall migratory periods, the combined movements of the spill and fur seals could result in a severe impact to the

population. This problem becomes even more serious when one considers the cumulative effects from the St. George Basin sale as well as the status of the declining fur seal population (it is being considered for addition to the threatened species list under ESA).

The DEIS also overlooks additional information which might be relevant to this discussion. For example, Oritsland et al. (1981) reports on a 1980 study of the effects of oil on polar bears. Three polar bears were immersed for 15 to 50 minutes in a pool containing a 1-centimeter slick of crude oil. Two of the three bears died within six weeks, and the third was saved only after "intensive and prolonged therapy" to reverse "severe anemia and renal failure."

In addition to this tragic result, the study led to several important findings. First, the polar bears not only showed no aversion to oil, but actively ingested the oil by licking it off their fur and even from the cage walls. Second, oil fouling caused severe cold stress in polar bears, by reducing the insulating value of the fur and increasing dilation of blood vessels in the skin, resulting in a marked increase in body heat loss under all wind conditions. Third, ingestion of oil by the bear was acutely toxic to a wide range of internal organs, including the brain, liver, bone marrow, intestines, lungs, and kidneys. Fourth, the toxic effect of the oil was latent and did not become apparent until three to five weeks after initial contact with the oil. The study concluded that polar bears should be totally protected from contact with oilspills and, if contact with oil occurred, immediate immobilization, cleaning, and treatment of the animal was required - an operation which poses "obviously great" logistical difficulties.

Similar physiological effects might occur with other species which depend on their fur for insulation, such as fur seals and sea otters. These animals could be expected to ingest oil in attempting to clean their fur. This ingestion could result in organ damage similar in nature to that observed in polar bears.

6-13 P. IV-B-48. There is no justification for the assessment that "a maximum of 400 to 700 otters" would be affected by a spill. This analysis seems to assume uniformly spaced animals, which is unrealistic. Otters have been observed in rafts up to 1,000 animals. It is quite conceivable that losses could be considerably higher than this number, especially given the problems we pointed out with the oilspill risk analysis.

6-14 P. IV-B-52. Startle reactions from noise, even though "transitory and brief in duration," can have harmful effects. This is true for rookeries and haulouts, as well as for animals along the ice front or in feeding areas.

Fay (per. comm.) notes:

> "The effects of noise and other disturbances seem to be regarded in the DEIS as trivial in most instances, but I think that is not realistic. Aircraft and boats cannot be just dispensed with as mere mechanical objects that pass by with "very transitory and brief" effects (IV-B-52), for they all have human operators, most of whom are intensely curious about marine mammals and will divert again and again to have a look at them at close (disturbing) range. Furthermore, those boats and aircraft will not be the first or the only sources of disturbance: the marine mammals of the region already are heavily impacted by disturbing aircraft and boats, at least during spring, summer, and fall. That fact has not been taken into account here. The new sources of disturbance from OCS activities will be <u>in addition</u> to the present ones."

6-15 P. IV-B-54. Given the large numbers of pinnipeds and other on the south side of the Peninsula, we find it hard to believe that MMS does not analyze the impact of the tankering facility and associated activities on these animals.

6-16 P. IV-B-61. There still remains considerable uncertainty regarding the effects of seismic testing on endangered whales. At the 1985 bowhead conference this was pointed out time and time again. Ljungblad et al. (1985) reported bowheads eliciting startle responses and movement away from seismic activities at distances ranging from 3.5 km to 6.7 km. ...Clark et al. (1985) reported that gray whales did respond to industrial noise. Whales began moving offshore to "avoid" the sound source at distances around 2-3 km. There was also a distinct reaction to noise from gray whale mother/calf pairs which included slower speeds, meandering, and turning away from the sound source.

Because of this and the lack of information on the effects of seismic activities on gray whales in the lease area (i.e. feeding, use of lagoons, etc.), we do not believe that the conclusion on IV-B-66 regarding noise is fully accurate or supported by the data.

6-17 P. IV-B-64. The impacts of an oilspill on gray whales (also bowheads, right whales, or other baleen whales) is certainly an unknown quantity at present. There are major data gaps with regard to the effects of oil on baleen, skin, eyes, the digestive tract, and the respiratory systems of endangered whales. While the DEIS does present most of the available data on this topic, the uncertainties surrounding these topics have not been discussed. A few examples follow:

--Baleen fouling. Experimental evidence indicates that oil can foul baleen, with the degree of fouling apparently determined by the type and quantity of oil and species. However, these experiments do not answer the obvious question: How well does baleen filter oil (or oil contaminated prey) from the water?

This has a direct relationship on whether or not a whale might ingest oil. There is little or no information on what the effects of ingestion of oil might be on endangered whales.

A side issue here concerns the effect on gray whales of oil which has gotten into sediments. Gray whales feed on benthic organisms and apparently "plow" the bottom to get them. Oil in sediments could be a serious problem for whales if they were feeding in the area. There is no information which indicates that they could detect such oil or would avoid it. There are indications that the nearshore area for the North Aleutian Basin could be important for gray whale feeding. The effects of an oilspill could be very important in this region if the oil got into these feeding areas.

--There is very little information on the effects of oil on cetacean skin. The work of Geraci and St. Aubin on dolphins suggests that this may not be a problem. However, so far as we can determine, they did not make an attempt to track the fate of the oil, i.e: Did the oil dissipate out of the skin into the water after the cups were removed, or did the oil (or a fraction of the oil) move into the skin or the bloodstream? This question is central to the understanding of the possible impacts on cetacean skin. This question is further complicated for animals such as gray whales or bowheads, which have roughened or irregular skin surfaces which may be more likely to retain oil over time.

--There is also little or no information on the effects of inhalation of vapors by cetaceans. Geraci and St. Aubin simply estimated the amount of vapor which might be inhaled for a hypothetical slick. So many factors enter into this question that their information must be viewed as hypothetical at best. No actual laboratory or field work has been done on this, and the potential impacts are simply not known.

We believe that, based on these considerations, it is improper for the DEIS to draw firm conclusions regarding the effects of leasing on marine mammals in the North Aleutian Basin.

II. COMMENTS ON DEIS SECTIONS III.B.1. and IV.B.1.a.

III.B.1. Fisheries Resources

GENERAL COMMENTS

Overall, this section of the DEIS presents a fairly accurate and comprehensive review of the available information on major species of fish and shellfish inhabiting or utilizing the North Aleutian Shelf. There are some inaccuracies and contradications, which have been noted in the "Specific Comments" section which follows.

It should be noted here that while the DEIS presents a summary of available information, the commercial fishing industry of Alaska is very much concerned with the "unknowns" for the North Aleutian Basin. For example:

The synthesis report (Thorsteinson, 1984) states that "the distribution, abundance and population dynamics of red king crab in nearshore waters of the North Aleutian Shelf are poorly described. Despite many crab surveys in the southeastern Bering Sea, little work has been done shoreward of the 50- to 60-m isobaths." The DEIS also acknowledges this lack of information (IV-B-33) when it states that, "Information on the distribution or habitat preferences of the 0- to 2- year classes of juveniles is not complete." And later that, "Identification of juvenile king crab habitat along the northern side of the Alaska Peninsula has not been completed."

This lack of information is of concern to the United Fishermen of Alaska, and we feel that information such as the example given above is necessary in order to make an accurate assessment of potential impacts.

A description of UFA's concerns regarding specific information needs for the North Aleutian Basin can be found under separate cover.

The following are specific comments on the Fisheries Resources section of the DEIS.

SPECIFIC COMMENTS

Salmonids

6-18 II-B-1, last sentence on the page continuing on to II-B-2. "Migration rates for the five species from the shelf edge to the Kvichak River in Bristol Bay were estimated by Straty (1981) as ranging from 45 to 60 kilometers per day." Actually, only migration rates for sockeye and coho are known -- rates for the other species are hypothetical. As is stated in the synthesis report (Thorsteinson, 1984), "Straty (1982; communication at the meeting) estimates rates of travel for juvenile sockeye and coho salmon . . . at 11.5 and 14.3 km/d, respectively" and, "presumeably pink, chum, and chinook salmon would travel at slightly lesser or greater rates depending on comparative size under the same conditions; however, there are not data to ascertain this."

6-19 II-B-2, first paragraph, sentence beginning, "Juvenile salmon inhabit nearshore waters. . . " All of this information which is presented under the generally heading of "Salmonids" was presented in the synthesis report as pertaining only to sockeye salmon. In fact, the synthesis report (Thornsteinson, 1984) states, "Of the five species of Pacific salmon inhabiting the Bering Sea, only sockeye salmon have been studied sufficiently to describe in some detail their seaward migration. Information on the seaward migration of the other species of salmon from Bristol Bay and salmon from streams draining the north side of the Alaska Peninsula is fragmentary and obtained incidentally from the sockeye studies (Straty 1974; Straty and Jaenicke 1980; Straty 1982) or from casual observation by area fishery managers."

6-20 II-B-2. Figure III-4 (although correctly titled) is referenced as describing juvenile salmon seaward migration. However, this figure depicts only outmigration patterns for juvenile sockeye. Furthermore, since all the migration patterns are hypothetical (as indicated by the use of "broken arrows"), the text should make some mention of this.

6-21 III-B-2, second paragraph, 8th line. "On the northern side of the Alaska Peninsula, nearly every drainage supports a run of sockeye." Although many drainages support sockeye runs, a few local stocks contribute very significantly to the regional population. As stated earlier in the paragraph, major Bristol Bay runs are in the Kvichak, Naknek, and Nushagak Rivers. Data from ADF&G indicate that Naknek and Kvichak River salmon stocks frequently produce over 50% of the sockeye salmon harvested in Bristol Bay, and in 1979 accounted for 70% of the total harvest."

6-22 III-B-3, 4th paragraph on page. Chinook. The first sentence describes the spawning migration of chinook salmon and references Figure III-B-6. Later, on page II-B-4, first paragraph, 5th line to end; reference is made to the hypothetical nature of the information presented in this figure. This should be made clear when Figure III-6 is first referred to.

Pacific Herring

6-23 III-B-6, 5th paragraph. This states that eelgrass and kelp are preferred spawning substrates but that ". . . roe may be deposited on whatever substrate is available." Is there a reference to back up this claim?

Capelin

6-24 III-B-6,7. Capelin is described solely as a forage fish. There should, however, be some discussion of the commercial value of capelin. There is a potential for commercial fisheries for capelin to develop along the northern Alaska Peninsula, and 18 tons were taken in 1983 (ADF&G).

Red King Crab

6-25 II-B-16. The synthesis report (Thorsteinson, 1984) states that "the distribution, abundance and population dynbamics of red king crab in nearshore waters of the North Aleutian Shelf are poorly described. Despite many crab surveys in the southeastern Bering Sea, little work has been done shoreward of the 50- to 60-m isobaths." However, the DEIS resource assessment for king crab does not mention this need for nearshore data. Later in the DEIS (IV-B-33) it is stated that, "Information on the distribution or habitat preferences of the 0- to 2-year classes of juveniles is not complete," and that "identification of juvenile king crab habitat along the northern side of the Alaska Peninsula has not been completed." This lack of information should also be indicated in the resource assessment.

IV.B.1.a. Effects On Fisheries Resources

GENERAL COMMENTS

The DEIS makes a number of inaccurate, critical assumptions concerning the fate and effects of spilled oil which result in grossly underestimated assessment of potential impacts on fisheries resources. These assumptions include:

1. The maximum area effected from the worst case spill of 100,000 barrels is 200 km2.

2. Effects on a local population of fish have a negligible or minor effect on the regional population.

3. Following a spill, oil remains toxic to marine organisms for only 7-12 days.

4. Adult marine organisms experience lethal effects from exposure to 1-100 ppm of hydrocarbons. Larvae and some eggs experience lethal effects from exposure to 0.1-1.0 ppm of hydrocarbons. Adults and larvae experience sublethal effects from exposure to 0.01-1.0 ppm of hydrocarbons. (Table IV-14)

A more specific discussion of each of the above mentioned items follows.

1. Area Affected by An Oil Spill

6-26 The DEIS consistently claims that in the worst case scenario of a 100,000 barrel spill, the largest area affected would be 200 km2. This argument is repeatedly used to assert that when adverse biological effects result, they would be very limited in scope due to the limited area impacted (IV-B-10, IV-B-14, IV-B-15, IV-B-18, IV-B-19, IV-B-21, IV-B-25, IV-B-26, IV-B-27, IV-B-30, IV-B-34, IV-B-36).

This assumption is unsubstantiated in the DEIS and is, further, indefensible (Howarth, 1985a). Analysis of actual offshore oil spills shows that much larger areas can be affected. Examples of past spills and the areas affected include the following:

- The Bravo spill of approximately 70,000 barrels covered approximately 4,000 km2 (Audunson 1977; Teal and Howarth 1984).

- The Argo Merchant spill of 163,000 barrels affected an area greater than 20,000 km2 (Gross and Mattson 1977; Howarth 1985).

Thus, the Bravo spill, which was two-thirds the size of the projected worst case spill of 100,000 barrels for the North Aleutian Shelf, spread to an area twenty times that estimated in the DEIS! The 100,000 barrel spill considered for impact assessment for the North Aleutian Basin is two-thirds the size of the Argo Merchant spill. Two-thirds of the area impacted by the Argo Merchant spill is roughly 14,000 km2 -- seventy times the area estimated to be impacted in the North Aleutian Shelf.

This gross underestimation of the areal extent of the anticipated oil spill has resulted in a gross underestimation of the potential impacts of such a spill.

2. Effects on a Local Population of Fish vs. Effects on a Regional Population of Fish.

The DEIS makes several assertions and conclusions concerning the relationship between local and regional populations of fish: (a) Because the areal extent of the predicted oil spill is assumed to be just 200 km2, only a small porportion of the fish in the lease area are predicted to be impacted by a spill. (b) Because a particular fish species is widely distributed throughout the lease area, oil spill impacts will be of local magnitude rather than regional. (c) Local populations of fish do not contribute significantly to regional populations.

The assertions and conclusions are inaccurate for the following reasons:

6-27 a,b. Because the area potentially affected by a spill has been grossly underestimated (Howarth, 1985a), the quantity of fish affected has been grossly underestimated. Actually, then, a much larger proportion of a regional population could be impacted by a spill. Using the area impacted by past spills of the size considered in the worst case scenario (see discussion above under point #1), an area of the North Aleutian Basin covering 14,000 km2 or more could be impacted -- i.e., two-thirds of the entire lease area and, thus, two-thirds of a widely distributed fish population. Thus, although a species may be well distributed throughout the lease area, impacts of an oil spill should not considered to affect only "local" populations. A significant portion of a regional could be affected by a major oil spill.

6-28 c. Additionaly, the impact analysis often concludes that because only a local population of fish is effected, there is no impact on the regional population. However, a local population can represent a significant portion of the total stock. An example would be the Naknek and Kvichak River sockeye stocks which often produce over 50% of the sockeye salmon harvested in Bristol Bay -- and in 1979 accounted for 70% of the total harvest (ADF&G). Additionally, local stocks, such as the herring which spawn in Port Moller, may be genetically separate from regional populations. Genetically segregate stocks may not be replaced by immigration from regional populations (ADF&G).

3. Toxicity of Oil Following an Oil Spill

6-29 The DEIS makes two assertions related to the toxicity of oil following a spill. The first is that "the possibility of reaching and sustaining lethal concentrations of oil in the ocean after a spill is considered remote because of mixing, dilution, and weathering." This assumption contradicts effects documented from past spills (Howarth, 1985a):

- Concentrations of oil following the Argo Merchant spill were as high as 0.210 ppm down to a depth of 20 m (Vandermeulen 1982).

- Following the Amoco Cadiz spill, a near uniform contamination of the water column occurred with concentrations of up to 0.100 ppm found down to 100 m (Marchand 1978).

These sustained concentrations thoughout a large portion of the water column, would be expected to kill fish eggs and larvae (Table IV-14 in the DEIS), and the Argo Merchant oil spill apparently caused a signficiant mortality of fish eggs (Teal and Howarth 1984).

6-30 The second assertion is that "highly toxic aromatic compounds rapidly evaporate into the air, so an oil slick on the water surface remains toxic to organisms for approximately a week, depending primarily on temperature." (IV-B-2). Actually, much longer effects of toxicity have been documented (Howarth, 1985a). Examples include:

- The IXTOC blowout was apparently still toxic even after it had traveled 1,000 km across the Gulf of Mexico (Jernelow and Linden 1981).

- Following the Argo Merchant spill, concentrations of dissolved oil on Georges Bank remained above background levels for at least 5 months following the spill (Boehm et al 1978; Farrington and Boehm 1985; Howarth 1985).

Two factors which are hypothesized to have contributed to the long residence time of the dissolved oil in Georges Bank are low temperatures and storm turbulence -- conditions which are also to be expected in the Bering Sea (Howarth, 1985a).

A stronger statement, "Aromatic compounds in crude oil spilled in the southeastern Bering Sea were estimated to weather in 10 to 12 days (Hameedi, 1982) is later made on page IV-B-2 of the DEIS. [Aromatic hydrocarbons are often considered the most toxic constitutents of oil (National Academy of Sciences, 1975; Howarth, 1985).] However, Howarth (1985a) states that "recent evidence strong indicates that oil may remain toxic for much, much longer than the DEIS assumes and much longer even the conclusions of Hameedi, as cited in the DEIS, would indicate."

4. Concentration of Oil Producing Lethal and Sublethal Effects.

The values presented as the concentrations of oil producing lethal and sublethal effects are both misleading and inaccurate.

Firstly, Tables IV-13 and IV-14 (II-B-2,3), which provide values for concentrations of hydrocarbons at which lethal and sublethal effects occur, are misleading: The values presented are an estimate of the LC-50, or the dose at which 50% of test organisms died when exposed in laboratory experiments for a period of 96 hours. By definition, more organisms would die with a longer test incubation, and half of the test organisms died at concentrations below this mean value. Therefore, it is wrong to assume, as the DEIS repeatedly does, that lethal toxicity
6-31 will not occur at concentrations below the LC-50 value (Howarth, 1985a).

In addition, the literature values of LC-50's are not precisely known quantities (Howarth, 1985a). Malins and Hodgins (1981) warn about the "virtual futility of attempting to closely compare or inter-relate different experiments" used to estimate lethality.

Secondly, the values for both (a) lethal, and (b) sublethal effects on fish eggs and larvae are greatly underestimated, mainly from reliance on an excessively old review of the toxic effects of oil published by Moore and Dwyer in 1974 (Howarth, 1985a).

a. **Lethal Effects**

Table IV-14 indicates that the lethal concentration range of oil for larvae and adults is 0.1 to 1.0 ppm. A tremendous amount of research on this topic indicates that much lower concentrations are toxic. For example, Vandermeulen and Capuzzo (in press) concluded that petroleum concentrations as low as 0.002 to 0.01 ppm can
6-32 decrease larval fish viability.

To be safe, the DEIS should have assumed that lethal mortality of oil can occur at concentrations of oil 10 to 100 times lower than the LC-50. (Howarth, 1985a). By not including such a safety factor, the DEIS has seriously underestimated the possible lethality even to adult fish and shellfish (Howarth, 1985a).

b. **Sublethal Effects**

Sublethal effects were underestimated in Table IV-14 also. Sublethal effects have been demonstrated in a variety of marine organisms at concentrations of oil as low as 0.002 ppm to 0.010 ppm (Jacobson and Boyland 1973; Johnson 1977; Steele 1979; Howarth 1985).

Very low concentrations of oil could potentially affect fishery recruitment even at concentrations too low to cause outright
6-33 mortality in fish eggs and larvae (Howarth 1985). Potential effects include: (1) delayed hatching of eggs and slowing of the growth of larvae (Kuhnhold et al 1978); (2) exposure of eggs and larvae to more predation caused by slower growth rates (Cushing, 1976 -- Cushing further hypothesizes that larval growth rate may be the most important factor controlling recruitment); and (3) decreased survival of fish eggs, embryos and larvae caused by oil exposure to adult females just prior to spawning (Struhsake, 1977; Kuhnhold et al, 1978).

The DEIS (IV-B-4) acknowledges that sublethal effects occur: "Fish embryos and larvae may have abnormal growth and development following exposure to Prudhoe Bay crude oil at concentrations as low as 27 ppb. Exposure to levels as low as 25 ppb resulted in fewer numbers of herring eggs hatching, and in abnormal growth and development of larvae." However, the DEIS makes no attempt to evaluate the importance of these effects on fishery resources.

Other general (and substantial) inaccuracies in the assessment of effects on fisheries include the following:

1. MMS refers to two types of probabilities for oil impacting a specific area -- conditional and final. Conditional probabilities assume that an oil spill has occured. These probabilities are appropriate for use in impact assessment as it is predicted (and thus must be assumed) that an oil spill of 1,000 to 100,000 barrels __will__ occur.

   MMS, however, constantly refers thoughout the impacts assessment to the "probability of an oil spill occuring and subsequently contacting" a specific area. These are "final probabilities" and
6-34 appear deceptively low due to adding in probabilities associated with oil spill occurence.

   For example, in the event of an oil spill, there is a 99.5% chance of oil contacting the Port Moller area within three days. The "final" probability is 20%, and is offered frequently throughout the DEIS to downplay potential impacts.

6-35 2. For a number of fish species, an assessment was made of the impacts of a spill on populations inhabiting or utilizing the southern side of the Alaska Peninsula. No oil spill modeling or trajectory analysis for this area has been performed, therefore, it is hard to believe that MMS to evaluate potential impacts on the southern side of the Peninsula.

SPECIFIC COMMENTS

The following are additional, specific comments on sections IV.B.1.a. (1) General Discussion; and IV.B.1.a.(2) Site-Specific Effects of Oil Spills.

B.1.a.(1) General Discussion

6-36 p. IV-B-5. The DEIS acknowledges that the sublethal longterm effects of exposure to drilling fluids and cuttings is incomplete. This information is needed to accurately assess impacts.

IV-B-9, paragraph 2. "It is expected that the seismic surveys would
6-37 have a negligible effect on the fisheries resources of the North Aleutian Basin lease area." The following should be added: "Provided explosive energy sources are not used."

6-38 IV-B-10. The impact assessment of an oil spill on pelagic habitat assumes that only an area of 200 km2 will be affected. The area impacted would most likely be far greater than this, and could affect a significant portion of the entire lease area (Howarth, 1985a).

6-39 IV-B-11,12. The DEIS explains that oil will reach sediments following most spills and that once in the sediments, oil can persist for more than 12 years following a spill. This oil can be slowly released from sediments for many years, creating a very long term effect on benthic organisms and nearshore or nearbottom dwellers (Vandermeulen and Gardon 1976, IV-B-13). Although this release is mentioned in the DEIS as a potential longterm pollution problem, this problem was not discussed in any of the site-specific fishery analyses.

6-40 IV-B-11. The DEIS contradicts itself by stating that "potential hydrocarbon effects resulting from oil spills on the benthic habitat are limited." There is general agreement among scientists that oil can have major deleterious and long lasting effects on benthic communities (Sanders at al 1980; Cabioch et al 1981; d'Ozouville et al 1979; Glemarec and Hussenot 1981; Addy et al 1978; Elmgren and Frithsen 1982; Grassle et al 1981; Linden et al 1980; Elmgren et al 1980-a, 1980-b; Boucher 1981; Teal and Howarth 1984, Howarth 1985).

6-41 IV-B-11. The DEIS again contradicts itself when describing the situation in the North Sea, where Ward et al (1980) found evidence of sediments contaminated with oil within 30 km of oil rigs -- which is equivalent to an area of 700 km2 per rig (Howarth, 1985a). In the case of at least one platform studied, this oil contamination appears to be associated with decreased numbers of animals and decreased numbers of animal species (Addy et al 1978).

6-42 IV-B-13, paragraph 1. "Adult fish may avoid nearshore areas, so they may have a more limited exposure period during which to take up lethal concentrations and die." Later in the DEIS (IV-B-15, paragraph 2), it is stated that "Adult salmon avoided hydrocarbon concentrations greater than 3.2 ppm, but passed through concentrations up to 3.2 ppm . . . (Weber et al, 1981)." Table IV-14 givens an LC-50 value for adult fish at 1 ppm. Thus it appears that there is some question as to whether adult fish will avoid nearshore areas where toxic concentrations of oil exist.

B.1.a.(2) Site-Specific Effects of Oil Spills

Effects on Salmonids

6-43 IV-B-13, paragraph 5. "In the spring and summer, prespawning adults . . ." should read, In the spring, summer and fall. . ." The DEIS previously stated that pink (III-B-4) spawning runs and coho (III-B-5) spawning runs occur generally from September to October.

IV-B-14, paragraph 4. The evaluation of effects of an offshore oil spill on pelagic, adult salmon were based on a number of inaccurate assumptions:

6-44 1. "Mortalities are expected to be quite limited because concentrations in open-water areas are generally well below 1 ppm;" and that, "Adult salmon are killed by exposure to concentrations of 1 to 3 ppm."

The DEIS previously stated (IV-B-2) that "Aromatic compounds in crude oil spilled in the southeastern Bering Sea were estimated to weather in 10 to 12 days (Hameedi, 1982)." Howarth (1985a) asserts that "recent evidence strongly indicates that oil may remain toxic for . . . much longer even than the conclusions of Hameedi, as cited in the DEIS, would indicate." Furthermore, the values presented in Table IV-14 are LC-50 values, or the concentrations of hydrocarbons at which 50% of test organisms died when exposed in laboratory experiments for a period of 96 hours. Therefore, it is wrong to assume that lethal toxicity will not occur at concentrations below the LC-50 value (Howarth, 1985a).

6-45 2. The impact assessment assumes that only an area of 200 km2 will be affected by an oilspill. The area impacted would most likely be far greater than this, and could affect a significant portion of the entire lease area (Howarth, 1985a).

6-46 3. "The portion of a salmon population affected would be limited because of the widespread distribution of salmon in pelagic habitats."

The area affected is likely to be much larger than 200 km2 (Howarth, 1985a), thus, a significant portion of the regional population could be affected. Additionally, populations of adult salmon are discrete in time and location (see description under Fisheries Resources in the DEIS).

6-47 4. Extensive alternate fish habitat is available in the North Aleutian Basin area (the assumption being that fish will avoid the oil).

The DEIS (IV-B-15, paragraph 2) states that "Adult salmon avoided hydrocarbon concentrations greater than 3.2 ppm, but passed through concentrations up to 3.2 ppm . . . (Weber et al, 1981)." Table IV-14 givens an LC-50 value for adult fish at 1 ppm. Thus it appears that there is some question as to whether adult fish will avoid toxic concentrations of oil.

6-48 IV-B-14, paragraph 4. Based on the above, the impacts of an offshore oil spill on pelagic, adult salmon should be changed from MINOR to MAJOR.

IV-B-14,15. For oil contacting nearshore and estuarine areas and affecting both adults migrating to spawning streams, and fry or juveniles prior to migrating offshore; the effects are estimated to be moderate at worst. The DEIS underestimated the potential impacts based on the following inaccuracies; thus, the impact should be changed to MAJOR.

6-49 1. The impact assessment of an oil spill assumes that only an area of 200 km2 will be affected. The area impactad would most likely be far greater than this, and could affect a significant portion of the entire lease area (Howarth, 1985a).

6-50 2. It is also assumed that the portion of a regional population killed would be limited by the size and temporal segregation of spawning distributions." The size and temporal segregation of spawning stocks increases their risk to impacts from an oil spill. Local stocks often represent a significant portion of the total stocks. For example, the Naknek and Kvichak River sockeye stocks (very segregated spatially and temporally) often produce over 50% of the sockeye salmon harvested in Bristol Bay (ADF&G).

6-51 IV-B-15, paragraph 2. "Adult salmon avoided hydrocarbon concentrations greater than 3.2 ppm, but passed through concentrations up to 3.2 ppm which approach acutely toxic levels (Weber et al., 1981)." Concentration levels of 3.2 ppm do not "approach" acutely toxic levels, but rather are acutely toxic levels. In fact, Table IV-14 indicates (in LC-50 values) toxic levels for adult fish as 1 ppm. Furthermore, the values presented in Table IV-14 are LC-50 values, or the concentrations of hydrocarbons at which 50% of test organisms died when exposed in laboratory experiments for a period of 96 hours. Therefore, toxicity will occur at concentrations below the LC-50 value (Howarth, 1985a) -- or below 1 ppm. Thus, the results of Weber et al (1981) appears to indicate that adult fish will not avoid toxic concentrations of oil up to 3.2 ppm, but will instead continue migration.

6-52 IV-B-15, paragraph 2. The DEIS claims that "The avoidance of spawning streams due to an oil spill which contacted estuarine areas could have an adverse effect on a portion of a population by reducing spawning success, but Malins et al (1978) found that the salmon's homing ability was delayed, but not prevented, by contact with hydrocarbons." The is in contradiction with the previous claim that adults migrate through toxic concentrations up to 3.2 ppm. Additionally, the intent of this statement is not entirely clear -- i.e., where do salmon go during a "delay"? This statement also implies that spawning success is dependent upon non-avoidance of spawning streams. However, what would the effects on spawning success (and resultant egg viability) be of salmon migrating through hydrocarbons?

6-53 IV-B-15, paragraph 2. The claim is then made that, "Following a spill, hydrocarbon concentrations in open-water areas are usually less than 1 ppm; such concentrations should not divert or delay migrating salmon." Although these concentrations may not alter migration, they could cause lethal effects to adults migrating through the area. Values presented in Table IV-14 indicate that LC-50 levels of 1 ppm of hydrocarbons were shown to be lethal to adult fish. However, lethal mortality levels of oil can occur at concentrations of oil 10 to 100 times lower than the LC-50 values (Howarth, 1985a).

IV-B-15, paragraph 2. The next statement claims that, "A large nearshore spill which resulted in higher concentrations of hydrocarbons contacting estuarines at spawning-run time is unlikely." This claim is unsubstantiated and untrue.

6-54 1. There is a 99.5% chance, for example, that oil will contact Port Moller (this will have nearshore effects) within 3 days (Table IV-15). The DEIS previously stated (IV-B-2) that "Aromatic compounds in crude oil spilled in the southeastern Bering Sea were estimated to weather in 10 to 12 days (Hameedi, 1982)." Howarth (1985a) asserts that "recent evidence strongly indicates that oil may remain toxic for . . much longer even than the conclusions of Hameedi, as cited in the DEIS, would indicate." Thus, the oil would still be toxic after 3 days.

6-55 2. The five species of salmon spawn from June through October (III-B). Thus, in the event of an oil spill, oil will could contact estuarines at spawning time during at least five months of the year.

6-56 IV-B-15, paragraph 2. "But if one [an oil spill affecting nearshores areas] occurred, it could result in either a delay of migration until the hydrocarbons dispersed to lower concentrations or in some diversion of migration." Again, this statement contradicts claims made earlier in the paragraph that salmon continued to migrate through lethal concentrations up to 3.2 ppm. Furthermore, "or in some diversion of migration" is a very broad and unsubstantiated statement.

6-57 IV-B-15, paragraph 2. "Because this would affect only a localized area, it could result in a moderate effect at worst on a regional population." The impact assessment of an oil spill assumes that only an area of 200 km2 will be affected. The area impacted would most likely be far greater than this, and could affect a significant portion of the entire lease area (Howarth, 1985a). Secondly, it assumes that effects on local populations would not have significant effects on regional populations. Local stocks often represent a significant portion of the total stocks. For example, the Naknek and Kvichak River sockeye stocks (very segregated spatially and temporally) often produce over 50% of the sockeye salmon harvested in Bristol Bay (ADF&G).

6-58 IV-B-15, paragraph 2. The inaccurate claim is again made that prespawning adults passing through hydrocarbon concentrations up to 3.2 ppm would be exposed to only sublethal effects."

6-59 IV-B-15, paragraph 2. The conclusion drawn from this fantastic and contradictory paragraph is that, "Overall, the effect of oil spills on spawning migrations of salmon is expected to be minor." Considering the high probability of an oil spill contacting nearshore areas during spawning runs (Table IV-15), the large potential area an oilspill could cover (Howarth, 1985a), the significant contribution which local, distinct stocks of salmon can make to regional populations, the discrepancies in the literature about migration vs. oil avoidance behavior (Weber et al, 1981 and Malins et al, 1978), and the unknown effects of on spawning success and egg viability of adults migrating through oil, it should be assumed that "effect of oil spills on spawning migrations on salmon could, indeed, be MAJOR."

IV-B-15, Paragraph 3. The DEIS states that there are several factors which limit the risk to salmon.

6-60 1. "Probabilities of an oil spill occurring and subsequently contacting important nearshore areas are very low for most areas." As discussed previously, conditional probabilities should be used in the impacts assessment. The probability of oil contacting Port Moller in the event of an oil spill is 99.5%. This is not a "very low" probability!

6-61 2. The impact assessment of an oil spill assumes that only an area of 200 km2 will be affected. The area impacted would most likely be far greater than this, and could affect a significant portion of the entire lease area (Howarth, 1985a).

6-62 IV-B-15 P 4. The description of outmigrating juvenile salmon actually describes information on sockeye salmon -- not the other five species (See synthesis report, Thorsteinson, 1984). Additionally, it is stated that "If the hydrocarbon concentrations exceeded 1 ppm, these juveniles could be killed." The values presented in Table IV-14 indicate that juveniles experience mortality at LC-50 values of 1 ppm. However, it is wrong to assume that lethal toxicity can occur at concentrations below the LC-50 value (Howarth, 1985a).

6-63 IV-B-16, paragraph 1. "Even assuming a nearshore spill which resulted in lethal concentrations; however, juvenile salmon migrating along the Alaska Peninsula are staggered over time by age, origin, and species. Consequently, only a small portion of a regional population would be contacted and killed during the time within which concentrations would be lethal." This conclusion is false. See arguments stated above concerning the significance of local populations on regional populations.

6-64 IV-B-16, paragraph 3 ". . . Could result in reduction of a local popluation of one or more salmon species. Salmon have extensive and widely distributed populations in the Bristol Bay/southeastern Bering Sea area, however; and a reduction in a localized area would not affect the regional population and thus would result in a moderate effect at worst." These conclusions are false. See arguments stated above concerning the significance of local populations on regional populations, and areal extent of the projected spill. Impacts could, thus, be MAJOR.

6-65 IV-B-16, paragraph 4. Describes extra susceptibility of pinks, but does not rate the effect.

6-66 IV-B-16,17. Descriptions of specific areas. Impacts are assumed to be negligible after thirty days. Howarth (1985a) states that, "The DEIS does not even attempt to model oil spill behavior beyond 30 days because of the difficulty in doing so, yet the actual time of concern may be many months."

6-67 IV-B-17 Port Moller. The analysis of effects is grossly underestimated and misrepresented, and once again "final" probabilities are offered to downplay risks. There is a 99.5% that oil will contact Port Moller within 3 days in the event of an oilspill. The DEIS previously stated (IV-B-2) that "Aromatic compounds in crude oil spilled in the southeastern Bering Sea were estimated to weather in 10 to 12 days (Hameedi, 1982)." Howarth (1985a) asserts that "recent evidence strongly indicates that oil may remain toxic for . . . much longer even than the conclusions of Hameedi, as cited in the DEIS, would indicate." Thus, the oil would still be toxic after 3 days, when it reached Port Moller. Additionally, adults of all five species of salmon spawn from June through October and juveniles and fry are hypothesized to be located in nearshore areas for much longer (III-B). Thus, it is ludicrous to suggest little likelihood "of an oilspill contacting nearshore areas while vulnerable were present, with hydrocarbon concentrations high enough to cause lethal effects." This probability is quite large, and the potential effects to salmon in the Port Moller area could be MAJOR.

6-68 IV-B-17 Izembek/Moffet Laggoons And Bechevin Bay. Why are the species most likely to be affected pinks and chums when all five species utilize these areas? Once again, final probabilities are presented.

6-69 IV-B-17 Unimak Pass. There is a 5% chance that an oil spill will contact this area within 3 days. The pass is only 80 km wide -- the area of a spill could be 200 km2 and will most likely be much greater (Howarth, 1985a). Concentrations at 3 days will mostly likely be toxic to adults (see previous discussion). Thus, lethal effects could occur for a large portion of the salmon migrating through the pass. Dependent upon the timing, the effects on salmon could be MAJOR.

6-70 IV-B-18 Southern Coast of the Alaska Peninsula. "There is a 33 percent probability of an oil spill of 1,000 barrels or greater occurring for tankering out of Balboa Bay." No oil spill modeling are trajectory analysis has been performed for the south side of the Peninsula. Thus, it would appear that MMS does not have the capability at this time to assess affects for this area.

6-71 IV-B-18, Summary of Effects on Salmonids. Again, a number of misleading or false assertions are made. "With the low probability of an oil spill resulting from this lease sale [there will be at least one spill of 1,000 to 100,000 barrels] and subsequently contacting these nearshore areas [there is a 99.5% of oil contacting Port Moller within 3 days] in lethal concentrations [see above discussion, the oil will most likely still be toxic to adult fish after three days] while vulnerable lifestages are present [at a minimum, May through November]. . . It is expected that the oil spill effects of this project on regional populations of salmon would be minor." Considering that all of the above assumptions are inaccurate, the impacts assessment should be changed to at MAJOR.

6-72 IV-B-19, Cumulative Effects on Salmonids. In the cumulative case, there is now a 21% chance of a spill of 1,000 barrels or greater occuring and contacting Unimak Pass within 3 days. Paragraph 2 states that "Unimak Pass is used by the portions of the salmon populations which overwinter in the Pacific Ocean and return to natal streams on the northern side of the Alaska Peninsula to spawn." It is presently hypothesized that many Bristol Bay stocks of outmigrating juveniles utilize Unimak Pass (Oral Status Report on RU 658, RU 659, January, 1985 in Seattle).

6-73 IV-B-19, paragraph 2. "A major oil spill of 100,000 barrels in or near Unimak Pass just prior to or during salmon migrations through the pass could result in a limited number of mortalities, diversion or delay in migration, or sublethal-toxicity effects." Why just a "limited number of mortalities"? What type of diversion in migration would occur?; i.e., what other options are available? If migration is not delayed, won't toxicity effects be enhanced by salmon continuing migration through the spill? It is claimed that salmon migrating through the pass are mixed by stock, age and origin. However, since it is believed that this is a major migration route for many stocks, a spill could have large adverse impact on many stocks. Potential effects could be MAJOR.

6-74 IV-B-19, paragraph 3. Inaccurate assumptions once again include that a maximum of 200 km2 will be affected, effects on local populations do not effect regional populations, adults experience lethal effects only at concentrations over 3 ppm, concentrations below 1 ppm would not harmful.

6-75 IV-B-19, Conclusion. The cumulative effect should be at least as that of the proposal effect. Thus cumulative effects should be estimated to be MAJOR.

Clupeiformes (includes herring)

6-76 IV-B-22, paragraph 2. Should be deleted. Deals solely with final probabilities.

6-77 IV-B-22, paragraph 3. "In order for adverse effects to result, a major oil spill resulting in hydrocarbon concentrations high enough to cause lethal and sublethal effects would have to occur and subsequently contact nearshore areas while susceptible lifestages were present." All of these contingencies have a high probability of occuring (for instance, there is a 99.5% chance of oil contacting Port Moller within 3 days -- see above for full discussion); thus, major effects are likely.

6-78 IV-B-22, Cape Newenham/Togiak. The probability estimates are confusing. Many of the probabilities quoted are final rather than conditional probabilities; i.e., what are the conditional probabilities for Cape Newenham, Egegik Bay and Kuskokwim Bay?

6-79 IV-B-22, Port Heiden. The DEIS states that there is a 25-percent of oil contacting Port Heiden within 30 days, and then claims that "these data reveal that the risk of oil-spill contact and subsequent effects on nearshore areas being used by spawning herring in the vicinity of Port Heiden is remote." A thirty percent chance of contact is not a "remote" possibility!

6-80 IV-B-23, Port Moller. The DEIS rates the 99.5 percent chance of oil contacting the Port Moller area within 3 days as "relatively high." This is an obvious understatement.

6-81 IV-B-23, paragraph 3. The DEIS mentions that effects of an oil spill contacting Port Moller would be mitigated because there are other spawning stocks in Togiak and Port Heiden. However, there is also a high probability that Port Heiden would be effected (a 30% chance of contact within thirty days of a spill). If the Port Moller/Port Hieden stocks were wiped out, this would be a significant portion of the regional population. The claim is also made and unsubstantiated that "recruitment would occur, and the effect on herring spawning in the Port Moller area would be ameliorated within a few years." Besides this claim being unsubstantiated, it has been hypothesized (ADF&G) that recruitment may not occur since the stocks are genetically segregate. Additionally, the claim that effects on herring spawning would be ameliorated within a few years does not take into account the effects on herring spawning substrate. Even if recruitment did occur, would the appropriate substrate for spawning be available?

6-82 IV-B-23, Southern Coast of the Alaska Peninsula. Oilspill trajectory analysis has not been performed for the southern side of the Alaska Peninsula. Thus, it is not feasible at this time that MMS could assess impacts for this area. Thus, the broad claim that "any mortalities which resulted would affect only a portion of the herring population spawning along the southern side of the Alaska Peninsula" is unfounded and unsubstantiated.

6-83 IV-B-24, Summary of Effects. "An oil spill which contacted nearshore areas being used by spawning adults, eggs, larvae and juveniles could result in a moderate effect." However, the DEIS states (IV-B-21) that "herring embryos exposed to a 1 ppm concentration of Prudhoe Bay crude oil had 100-percent mortality (Malins and Hodgins, 1981). Since there is a 99.5% chance of oil contacting Port Moller within 3 days and a 30% chance of oil contacting Port Heiden within thirty days, the effect on eggs could be catastrophic. Considering the importance of Port Moller as a spawning area as well as the near certainty of lethal concentrations of oil contacting it, the overall effect would most likely be MAJOR.

6-84 IV-B-24, Summary. "The risk of a major oil spill exposing nearshore areas to lethal concentrations of hydrocarbons, when vulnerable lifestages are concentrated in those areas, and producing a moderate effect is less likely." There is a 99.5% chance of oil contacting Port Moller within 3 days. Within three days concentrations of hydrocarbons will still be lethal to all life stages (see above discussion). Vulnerable lifestages are present from early spring through summer. Thus, the effect is likely to be MAJOR.

6-85 IV-B-24,25 Cumulative Effects. The DEIS once again bases its analysis of effects of a number of false assumptions including: the area impacted is at most 200 km2 again; concentrations of hydrocarbons will be well below 1 ppm and thus not lethal; adult fish experience mortality at 3-5. Since the area impacted is likely to be much greater than 200 km2 (Howarth, 1985a), concentrations below well below 1 ppm have been shown to be lethal to eggs and larvae (Table IV-15 and IV-B-21) and are should be considered lethal to adults (Howarth, 1985a), the effects of an oil spill on clupeiformes is likely to be MAJOR.

Groundfish

6-86 IV-B-26, paragraph 4. The impact assessment of an oil spill assumes that only an area of 200 km2 will be affected. The area impacted would most likely be far greater than this, and could affect a significant portion of the entire lease area (Howarth, 1985a).

6-87 IV-B-27, paragraph 1. The DEIS again presents final probabilities as a limiting factor. This is misleading since it is predicted that an oilspill will occur. It is also stated that "For moderate adverse effects on groundfish species of the North Aleutian Basin to occur, lethal concentrations of hydrocarbons from on oil spill would have to contact areas when eggs and larvae were present." However, eggs and larvae are present for roughly 3 months (IV-B-25); and lethal concentrations to eggs and larvae (0.1 ppm and less -- Table IV-14, Howarth, 1985a) would be present even after thirty days (Howarth, 1985a). Thus, this statement should not be presented as a limiting factor. Further, the DEIS states that "given the limited areal influence of a spill. . . " The assumption that only an area of 200 km2 will be affected is unsubstantiated and indefensible. The area impacted would most likely be far greater than this, and could affect a significant portion of the entire lease area (Howarth, 1985a).

6-88 IV-B-27, paragraph 2. DEIS again assumes 200 km2 is maximum area affected.

6-89 IV-B-28, paragraph 1. "An offshore oil spill which did not contact nearshore areas would result in limited mortality and sublethal effects on planktonic groundfish eggs and larvae." The DEIS (IV-B-26) previously stated that, "These stages [planktonic egg and larvae], which are susceptible to lethal concentrations of 0.1 to 1.0 ppm (Thorsteinson, 1984), may be killed as a result of encountering a slick or waters with concentrations of hydrocarbons less than 1 ppm.

6-90 IV-B-28, Conclusion. Effects could be MAJOR for nearshore areas and MODERATE for offshore areas.

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6-91 IV-B-28,29 CUMULATIVE. Incorrect assumptions again include that adult fish are lethally affected by 3-5 ppm of hydrocarbons, areal extent of a spill would only be 200 km2. Additionally, effects are only evaluated for adults in the offshore, benthic environment. Their is no discussion of the vulnerable pelagic eggs and larvae which inhabit surficial waters for three months of the year.

6-92 IV-B-29, Conclusion. Because of the increased probability of nearshore environments being impacted, cumulative effects are likely to be MAJOR.

Crabs

6-93 IV-B-30, paragraph 3. The DEIS assumes the area affected would only be 200 km2 thus only a small portion of the total population would be affected.

6-94 IV-B-30, Paragraph 4: "These lifestages (crab larvae, and juvenile and adult shrimp) . . . may experience mortality from exposure to the hydrocarbon concentrations of less than 1 ppm which are usually not exceeded following oil spills in open-water areas." This is very confusing. These life stages experience mortality at 0.1 ppm (Table IV-14). Since concentrations of 1 ppm or less are expected in the open ocean after a spill (Malins et al 1978), these lifestages would experience high levels of mortality.

6-95 IV-B-30, paragraph 4. The DEIS once again assumes an affected area of 200 km2 and, thus, that only localized affects would occur.

6-96 IV-B-30, paragraph 5. The DEIS states that "The most serious effects of an oil spill on fisheries resources would occur following a spill which contacted nearshore areas along the northern or southern side of the Alaska Peninsula." However, no oil spill modeling or trajectory analysis has not been performed for the south side of the Peninsula. Thus, impacts for this area cannot be assessed.

6-97 IV-B-31, paragraph 3. "The extent of a population increase would depend on the life stage(s) affected [shrimp larvae, adults and juveniles would be present in nearshore areas], the areal extent of the spill [could be much larger than 200 km2], the hydrocarbon concentration [predicted to be at least 1 ppm which is lethal for all lifestages of shrimp], and the length of contact [lethality occurs in a very short period of time LC-50 values -- concentrations tested for 96 hours -- were 0.1 ppm]."

6-98 IV-B-31, paragraph 3. The DEIS also states that "A major oil spill in a reproductively important nearshore area could cause a decrease in the local population and a moderate adverse affect on a regional population." Because the area affected was underestimated and the significance of local populations to regional population levels, the impact should be assessed as MAJOR.

6-99 IV-B-31, paragraph 3. Important Surf clam populations exist on southern side of the Peninsula, yet it is not possible at this time to assess affects for the south side.

6-100 IV-B-31, paragraph 3. "Clam larvae are planktonic before settling to the bottom for 1 to 4 months, during whch time they are particularly senstivie to hydrocarbons and are exposed to surface oil slicks. A major oil spill which contacted the surf clam population between Cape Seniavin and Port Heiden could affect adult clams and planktonic larvae and reduce this popuolation. These effects could take years to mitigate because the species is long-lived and slow to reach sexual maturaity." But the DEIS then states, "The oil-spill risk to the surf clam populations in the Cape Seniavin to Port Heiden area is very low." Yet there is a 25% of oil hitting Port Heiden within thirty days in concentrations lethal to clam larvae.

6-101 IV-B-32, paragraph 1. "Adults (king, tanner, dungeness and Korean hair crabs) experience mortalities at hydrocarbon concentrations of 1 to 4 ppm, which are improbable levels except in the event of a major nearshore oil spill." The DEIS previously stated (IV-B-2) that "Aromatic compounds in crude oil spilled in the southeastern Bering Sea were estimated to weather in 10 to 12 days (Hameedi, 1982)." Howarth (1985a) asserts that "recent evidence strongly indicates that oil may remain toxic for . . . much longer even than the conclusions of Hameedi, as cited in the DEIS, would indicate." Furthermore, the values presented in Table IV-14 are LC-50 values, or the concentrations of hydrocarbons at which 50% of test organisms died when exposed in laboratory experiments for a period of 96 hours. Therefore, it is wrong to assume that lethal toxicity will not occur at concentrations below the LC-50 value (Howarth, 1985a).

6-102 IV-B-32, Paragraph 2. The DEIS claims that the extent of the effect of an oil spill on nearshore lifestages of crabs would depend on the time of year [for a large percentage of time these life stages inhabit nearshore areas], the amount of oil spilled [worst case scenario assumes 100,000 barrels], the concentration [MMS' assumes less than 1 ppm, which is lethal to all lifestages of crab], the area contacted [could be much larger than 200 km2, (Howarth, 1985a)] and the number of individuals of vulnerable lifestages contacted. The conclusion should thus be that a MAJOR effect is likely to occur for a regional crab population.

6-103 IV-B-33, paragraph 1. There has been no oil spill modeling or trajectory analysis for the south side of the peninsula. Thus the the claim that "with the widespread distribution and seasonality of the larval lifestages, even a major oil spill would affect only a small portion of the regional populations of these species and would result in a moderate effect." is unfounded and unsubstantiated.

6-104 IV-B-34, Paragraph 1. Impacts are assessed assumed extent of a spill is 200 km2. The DEIS also mentions "limited juvenile and adult mortality" yet concentrations would be high enough to cause mortality for both of these lifestages.

6-105 IV-B-34, Paragraph 2. The DEIS was agains discusses final probabilites which are misleading and inappropriate to an impact assessment. The DEIS also mentions "a 99.5-percent chance of contact with the Port Moller area within 3 days while hydrocarbon concentrations are likely to be high enough. . ." Concentrations are expected after three days to be high high to cause mortality in all lifestages of king crab (Hameedi, 1982; Howarth, 1985a, Table IV-14).

6-106 IV-B-35, Summary. "A major offshore oil spill which did not contact important nearshore areas would result in limited mortality and sublethal effects on planktonic crab larvae, pelagic adult shrimp, benthic adult crabs, and planktonic food-web organisms." The phrase with "limited" is applicable only to the benthic adult crabs. The rest should read "would result in mortality and sublethal affects."

6-107 IV-B-35, paragraph 1. "Only a major oil spill, which contacted and exposed nearshore areas to lethal concentrations of hydrocarbons when vulnerable life stages are concentrated in those areas, is expected to produce a greater than minor effect on the regional population of one or more species." It is predicted that a major spill will occur, will contact nearshore areas (99.5% probability of contacting Port Moller within 3 days), will definitely be in concentrations high enough to cause lethal effects (see previous discussion). Thus, there could be a MAJOR effect.

6-108 IV-B-35, paragraph 2. "Red king crab, with its currently depressed populations levels, could be effected seriously (i.e., a major effect) by a major oil spill which contacted nearshore areas . . ." Considering the presently depressed populations levels of red king crab, and that the red king crab population is concentrated from Port Moller to Port Heiden, and that there is a 99.5% chance of oil contacting Port Moller within 3 days and a 25% of oil contacting Port Heiden within thirty days, an oil spill could potentially wipe out the entire population of red king crab. This is a potential CATASTROPHIC effect.

6-109 IV-B-35, Conclusion. Effects are potentially MAJOR for all species except red king crab for which there is a high probability of a CATASTROPHIC effect.

6-110 IV-B-36, paragraph 4. The DEIS mentions that cumulative probabilities go up for offshore targets but says that the effects on adult crabs will not increase because "concentrations in open-ocean areas following an oil spill are generally considerably less than 1 ppm". However, crabs experience lethal effects at 0.1 ppm (Table IV-13). Also it is stated that "Crabs also are much more widely distributed than the areal influence of even a major oil spill." A spill could cover much of the a large proportion of the lease area (Howarth, 1985a) and thus local populations could be a signficant percentage of the regional population.

6-111 IV-B-36, paragraph 5. The impact assessment again assumes that only 200 km2 would be affected.

Attached is some additional information relevant to the issues of OCS fisheries impacts. Included is an analysis by Dr. Howard Sanders (of Woods Hole Oceanographic Institute) of industry-sponsored studies concerning the long-term effects of offshore oil development on Gulf of Mexico fisheries. These studies, the Offshore Ecology Investigation by the Gulf Universities Research Consortium (commonly called the GURC studies), have often been cited by industry representatives as proof that little or no long-term effects on the fisheries of the Gulf have occurred as a result of offshore development in that region.

Dr. Sanders questions the assumption and conclusion of the GURC studies. He found that the research design was faulty and in fact indicated uniform, widespread contamination of the study area. Some of his other findings include:

- The GURC studies did not take into account transfer of pollutants to bottom sediments. Sanders found this to be readily documented from the literature and considered this to be a major omission;

- Benthic communities in the study area were depressed, and had a population dominated by opportunistic species indicating signficant effects from contaminants;

- Contrary to industry accounts, bottomfish biomass and species composition decreased as one drew closer to production platforms. The principal investigator attributed this in part to drilling mud disposal overboard; and

- Similar findings were made regarding benthic invertebrates.

Sander also includes some interesting information on the Ekofish field which shows similar trends beginning there, and a brief analysis of Straughman's work (1976) for API.

Also attached is a scientific analysis of Georges Bank by Robert

Houarth. Georges Bank has many similarities to the southeastern Bering Sea -- it is a highly productive area biologically, dominated by large numbers of demersal fish and shellfish; temperatures are cold; weather can be severe; and circulation regimes render the region a relatively discrete ecosystem. Some of the information provided by Houarth includes:

- Oil slick dissipation may be due to dissolution rather than evaporation, especially in high-energy situations (such as storms) where wave motion induces emulsification;
- Rates for biodegradation of spilled oil may be orders of magnitude lower in the field than laboratory tests indicate;
- Photo-oxidation by sunlight and ultraviolet light of spilled oil may well increase its toxicity;
- Oil transport to the bottom is a signficant impacting factor which could occur because of adsorption to sediments or by transfer via fecal pells of zooplankters. Waves can also drive oil deep into the water column,
- Oil effects on a variety of organisms. Of particular concern are the effects of the Argo Merchant spill on pollock and cod eggs. More than 90% of the eggs sampled near the ship were dead,
- Information on the effects of Louisiana commercial fisheries is provided, showing significantly lower catch per unit effort for some species.

Also attached is a report by Teal and Houarth (1984) on the ecological effects of spills; and a journal article by Houarth (1981) on the oil/fisheries issue.

I. Comments on DEIS Section IV-A-3 Oil Spill Risk Analysis

General Comments

We believe that the oilspill risk analysis is seriously flawed. The model uses very few launch sites in the lease area, and there are too few trajectory simulations (26 in open water, 36 with ice covers) to give a reasonable spill trajectory simulation from each of those sites. The model also covers such a large area, with relatively few targets (especially sea targets), that risks are seriously underestimated.

There are also problems relating to weather data - particularly winds - which could significantly affect the trajectory analysis. This is particularly true for the nearshore area. Also, the use of ice cover for winter is helpful only for years when ice is present. Many winters are ice-free. We recommend that simulations of ice free winter spill trajectories be performed.

And, finally, the analysis does not even attempt to model the oilspill trajectories on the south side of the Alaska Peninsula, We recommend that the FEIS include an oilspill trajectory analysis of the Balboa Bay facility and tanker routes into and out of that area.

Comments on the specific sections of the Risk Analysis are presented below.

A. The DEIS Uses Unreasonable Assumptions to Assess the Potential for Oilspills (DEIS at IV-A-7)

The method used in the DEIS to assess the possibilities of an oilspill in the North Aleutian Basin is similar to the approach used in other EIS's prepared by MMS. As has been pointed out in previous comments, this approach suffers from limitations which we believe causes the document to seriously underestimate the possibility of oilspills resulting from the proposed activity. This in turn causes the DEIS to underrate the threat posed by off-shore petroleum exploration and development to a range of biological resources in the sale area.

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The most obvious problem in the oilspill risk analysis section of the DEIS is that there is an implicit assumption that the risk of oilspills is constant throughout the United States' OCS. The DEIS makes no distinction between the hazardous conditions of northern frontier areas and more temperate areas such as the Gulf of Mexico and California. Substantial differences in climate, number of daylight hours, weather and visibility, oceanography, geology, seismicity, the presence of sea ice, remoteness of the lease area from support and supply bases, and a host of other factors strongly argue that the potential for accidents in the North Aleutian Basin (as well as other northern frontier basins) is much higher than for areas such as the Gulf of Mexico where most of the spill statistics come from. This failure insures that the DEIS underestimates the risks involved in exploring and/or developing the region.

A second issue is the comparison used in the DEIS of Alaska accidents rates to national OCS accident rates. The first, and most obvious criticism, is that MMS uses Alaskan non-OCS statistics and compares them to nationwide OCS statistics. We believe that this may well be inappropriate and certainly yields results which should be viewed with some reservations.

Cook Inlet field production has been declining over the past several years. Characteristically the years of declining production are also years of declining spill rates. Records of spills for the developmental years - years which historically have the higher spill rates - are incomplete, so a fair
6-113 evaluation is difficult.

Similarly, we question the use of Prudhoe Bay/Kuparuk statistics to support the claim that it is appropriate to apply southern OCS statistics to northern frontier areas. Prudhoe/Kuparuk field is an onshore field. Generally speaking, onshore fields are considered less hazardous to operate in than offshore fields, with the possible exception of gravel islands. What MMS' comparison seems to indicate is that operations onshore in the Arctic are about as hazardous as operating offshore elsewhere in the nation; not that Alaskan offshore areas are equally as hazardous as southern offshore areas such as the Gulf of Mexico and California. Carried to its extreme, this would indicate that onshore Arctic operations are more hazardous than onshore operations elsewhere and that perhaps the same could be held true for offshore operations.

We would point out that there are limitations to the tanker spill rate due to worldwide reporting practices. U.S. tanker spill statistics are probably the most complete; other nations generally don't have as stringent reporting requirements as the U.S. and many high seas spills probably go unreported as well. This probably results in a lower estimated rate than what is actually occurring.

As a final consideration, we would point out that the Futures Group reports that North Sea tanker spill rates were around three times the U.S. rate. While they stated that they could not draw firm conclusions because they only had three years of data, it is indicative to us that there may be higher spill rates in offshore areas where conditions are more extreme, such as the Bering Sea.

6-114 We suggest that MMS faithfully apply the rationale it has chosen to use regarding oilspills - i.e., spill rates are directly linked to the volume of oil produced. For Alaska, because no oil has been produced from the OCS or under conditions similar to offshore frontier areas in the Bering Sea, the oilspill rates are

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simply not known. This should be explicitly stated in the EIS, and the use of the combined probabilities in the risk analysis should be deleted.

B. <u>Oilspill Trajectory Analysis (DEIS at IV-A-10)</u>

By all accounts the Rand oilspill model is a sophisticated tool which employs state-of-the-art knowledge of the physical relationships between tides and wind-driven currents. However, serious questions regarding the use of this model remain and deserve to be addressed in the FEIS. These are discussed below:

1. For example, as we understand it, the weather data which is put into the model probably comes from a combination of sources, including land-based weather stations, the Climatic Atlas, and NOAA synoptic charts. However, it it impossible to tell from the DEIS what sources really are used. The literature citations offered in the DEIS do not contain this information. It is also difficult to judge from the DEIS sections on oceanography and meteorology what data sources are used. If the data for the model came from solely those sources cited in the oceanography
6-115 and meterology section of the DEIS, then the data used in the model certainly was not up to date nor complete. We would request that the FEIS cite the data sources used in the RAND model for circulation, and especially meteorology, so that we may review those materials.

A related problem is that there is apparently a distinct lack of real-time offshore weather data available. As we understand it, neither MMS nor RAND have been able to gain access to the Exxon buoy data for use in this EIS. Offshore data come from the NOAA facsimile or synoptic charts which are extrapolations from onshore weather stations. There are difficulties inherent in estimating surface winds from the calculated geostrophic wind;
6-116 and onshore weather stations are subject to localized weather phenomenon resulting from the interaction of weather systems with a land mass. We understand that there has been some attempt to compensate for this problem by using ship or buoy data. But this data is very limited. We believe that more reliable data is needed for the model to accurately predict spill movement, data collected over a number of years from a net of stations offshore.

There are also problems with nearshore weather as well. It is very difficult, given the literature available to us and our reviewers, to determine the boundary conditions of the model. It is therefore also very difficult to determine the model's effectiveness at predicting nearshore winds and resulting spill
6-117 movement. Close to Peninsula coastal winds become increasingly affected by orographic effects. This effect has been pointed out in other coastal areas. Recently, Schumacher and Moen (1983) observed that gaps in the mountain system (Pt. Moller and Cold Bay) perturb large scale winds. Therefore, circulation in the

nearshore area could be quite variable. It is unclear whether or not the model can predict these orographic effects and their subsequent effect on spill movement.

6-118 Similarly, it is impossible to determine whether or not the model can account for localized sea breezes along the coast. We believe that the information on such phenomenon (as well as large scale orographic weather effects) is sparse and that this lack of data seriously affects the utility of the model in the nearshore region.

6-119 2. We also have concerns regarding the way the model handles the data it receives. As we understand it, the model gives a picture of the "average" spill movement as projected over a long-term database. We have been unable to determine how long that database actually is, so for discussion purposes we will say 20 years. Our understanding is that the data are divided into three sets: summer, winter, fall. For these three sets, the 20 years of data (i.e., storm tracks, winds, etc.) are run through the model, and the results are summed up giving % probabilities for spill trajectories. Thus, what we have is the average probability that a spill will follow a particular trajectory. When the model is run randomly it does indeed come up with spill trajectories very close to the results one would expect from the input data.

The obvious problem here is that Bering Sea weather is highly variable, both on a day to day basis and on a year to year basis. Of course the model would show that the predicted spill trajectories would correlate with the input data, because that is what computer models are supposed to do. What it does not do is take into account variability in the Bering Sea. In the last few years, especially since 1970, there have been extraordinary variations in the short term climate over the North Pacific (Niebauer, 1980). The model apparently "averages" these out to a substantial degree. Because of this we believe that it is improper for the MMS to portray the oilspill probabilities as reliable numbers which accurately and definitely guage the risks to biological resources. Instead, we suggest that MMS should acknowledge that these are simply hypothetical spill trajectories which may be accurate under a limited set of circumstances.

6-120 3. Another problem with the model is that it assumes only surface slicks. There are many problems with this i.e., oil density, dispersion, etc. most of which are discussed in our comments on the DEIS discussion of the fate and behavior of spilled oil. We only point out here that these factors can seriously affect spill size and movement and that this limits the utility of the model. Given that the most likely source of spills in the North Aleutian Basin will be subsea blowouts or pipeline leaks (assuming no offshore loading), this places a real limitation on the spill trajectory analysis and the resulting impact analyses which rely on these numbers.

6-121 4. There are also problems with the way at-sea spills are handled by the model. As it stands now, unless a spill contacts a land segment or a sea-target, it doesn't register. This is a serious limitation on the model and severely limits the impact analyses in the DEIS. What happens to at-sea spills? They can also have serious impacts on biological resources, especially pelagic species such as seabirds and fur seals.

For example, as far as can be determined from the graphics in the DEIS, there is only one sea target for the nearshore waters between Unimak Pass and Port Moller. If a spill were to enter this region, it could have serious impacts on a range of biological resources, including (depending on the time of year) gray whales, walrus, large numbers of birds, and major fisheries resources such as salmon, crab, and bottomfish (particularly if oil became entrained in bottom sediments) as well as important commercial fishing activities. Yet, unless the spill goes ashore or hits that one point, it will register no impact in the trajectory analysis. Because of this, we believe that the oilspill model should have identified a band of sea targets in the nearshore waters along the Alaska Peninsula.

We also believe that the model should incorporate spill targets for commercial fishing areas. We cannot believe that the DEIS failed to identify the important fishing areas in the oilspill trajectory analysis, given the importance of the fishing in the region. We consider this a very serious omission, one that should definitely be corrected in the FEIS.

6-122 5. Finally, there is a problem with the way the DEIS reports the data obtained from the model. The spill probabilities are determined by season (with the NAB "year" divided into three seasons), yet the tables only report information on a yearly basis. Thus, for any season, the monthly probabilities are considered equal (despite the great variability which can occur between months), and the seasonal probabilities are summed. So, for example, the probability of a spill from point A to point B could be 100% in the summer (three months of the year) but only show up in the tables as a 25% probability, because the probability is computed over a yearly average. This example is only for discussion purposes, but we believe that this practice results in the DEIS significantly underestimating the risk to resources.

C. <u>Fate and Behavior of Spilled Oil (DEIS at IV-A-13)</u>

We are pleased to see that MMS included a section on the fate and behavior of spilled oil. Unfortunately, the discussion is quite limited and some inaccuries exist.

First, we disagree that most blowouts would be a surface spill.
Using drillships, jack-ups, or semisubmersibles, the most likely
blowout from each of these would probably be a subsea blowout. A
tanker spill could be both a surface and a subsea spill; and
6-123 pipeline spills would probably be either onshore or subsea. We
believe that the possibility of a subsea spill (versus a surface
spill) in the area is much higher than pictured in the DEIS.
Thus, we urge that the fate and behavior of subsea oilspills
should also be discussed.

Second, we believe that MMS consistently underestimates the area
which could be affected by a spill. Howarth (1985a) states:

> "The DEIS repeatedly states that even the largest of spills
> expected would affect an area of only 200 km^2. The DEIS
> uses this to argue that when adverse biological effects
> would occur, they would be very limited in scope (see pp.
> IV-B-10, IV-B-14, IV-B-15, IV-B-18, IV-B-19, IV-B-25,
> IV-B-26, IV-B-27, IV-B-30, IV-B-34, and IV-B-36). The DEIS
> never explains this assumption that a spill would affect an
> area of only 200 km^2, and the assumption is totally
> indefensible. An analysis of actual offshore oil spills of
> the size considered to be the worst case in the DEIS shows
> that they affect much larger areas. For example, the Bravo
> spill of approximately 70,000 barrels, somewhat smaller than
> the hypothetical worst-case 100,000 barrel spill considered
> by the DEIS, spread to cover approximately 4,000 km^2
> (Audunson 1977; Teal and Howarth 1984). A slightly larger
> 6-124 spill, the Argo Merchant (163,000 barrels), affected an area
> greater than 20,000 km^2 (Gross and Mattson 1977; Howarth
> 1985). Of course, oil spills can be much larger than the
> 100,000 barrel worst case considered by the DEIS. The Amoco
> Cadiz spilled approximately 1,500,000 barrels; the blowout
> of the IXTOC well spilled somewhere between 2,500,000 and
> 8,250,000 barrels (Teal and Howarth 1984). But even the
> smaller spills considered by the DEIS could affect the
> entire 22,000 km^2 of the proposed lease area. The
> potential effects from oil spills are much less "localized"
> than the DEIS concludes."

Other cases exist, for example, in February 1979, the 18,000 DWT
tanker Arrow grounded in Chedabucto Bay, Nova Scotia, and began
releasing its 4,565,000-gallon cargo of No. 6 fuel oil. Even
though not all of the oil was lost, oil contaminated over 1,200
square miles (768,000 acres); of 375 miles of shoreline in the
Chedabucto Bay area, spilled oil affected 190 miles. In
addition, Sable Island, over 100 miles away, was also
contaminated. The problem was compounded because winds kept
blowing the oil from one part of the Bay to another, continuously
reexposing the Bay to more pollution.

The fate of the oil in general was: one-third recovered,
one-third on the beaches, one-third at sea. The spilled oil
coated the shoreline, became imbedded in ice, and was dispersed

in the water (as particles of oil up to 1 mm in diameter) to a
depth of at least 260 ft. and extending over 110 miles in a band
6 to 15 miles wide.

Similar events could take place if an oilspill occurred in the
North Aleutian Basin region. Oilspills could remain at sea for
long periods (months) before coming ashore, or it could get into
upper Bristol Bay. Instead of being insignificant, these slicks
could have catastrophic effects on a range of important resources
as they are driven here and there by winds and tides. The DEIS
gives just the opposite impression. As we stated previously, oil
at sea is barely acknowledged as an impacting factor, and we
believe that this results in a serious underestimation of the
impacts of a spill in the region.

The text also states that evaporation accounts for about 25% of
the mass loss within 24 hours from an oil slick. Figure IV-3,
however, indicates that evaporation accounts for roughly 11%. At
10 days, evaporation accounts for only 17%, while dispersion into
the water column accounts for more than 27% of the oil. Over 82%
of the oil remains either floating or in the water column at 10
days.

Despite this, the DEIS repeatedly stresses that an oilspill is a
problem only during the first few days after the spill. Howarth
(1985a) states:

> 6-125 "The DEIS concludes that weathering of an oilspill reduces
> its toxicity very rapidly and so only the immediate effects
> of a spill need to be considered. In the summary table of
> effects, Table II-2, it is assumed that only the first 3
> days are important (see also p. IV-A-11). Later, the DEIS
> states that "an oil slick on the water surface remains toxic
> to organisms for approximately a week" (p. IV-B-2). Neither
> of these assumptions are referenced or adequately supported.
> When references are provided, they sometimes contradict the
> assumptions of the DEIS. For instance, immediately after
> asserting that oil slicks remain toxic for approximately a
> week, the DEIS references Hameedi (1982) as estimating that
> it took 10 to 12 days to weather the aromatic components of
> the crude oil spilled in the Bering Sea (p. IV-B-2 of DEIS).
> The aromatics are often considered the most toxic
> constituents of oil, and an oil's toxicity should persist
> for at least as long as the aromatics remain (National
> Academy of Sciences 1975; Howarth 1985).
>
> Recent evidence strongly indicates that oil may remain toxic
> for much, much longer than the DEIS assumes and much longer
> even than the conclusions of Hameedi, as cited in the DEIS,
> would indicate. The oil slick from the IXTOC blowout was
> apparently still toxic even after it had traveled 1,000 km
> across the Gulf of Mexico (Jernelov and Linden 1981).
> Following the Argo Merchant spill on Georges Bank, con-

centrations of dissloved oil, including toxic aromatic hydrocarbons, remained above background levels for at least 5 months (Boehm et al. 1978; Farrington and Boehm 1985; Howarth 1985). Two factors which likely contributed to the long residence time of this dissolved oil - low temperatures and storm turbulence - would also be expected to be important in the area of lease sale #92. Low temperatures slow evaporation while having less effect on dissolution to the water column (Hall et al. 1978; Howarth 1985), and storm turbulence increases the dispersion of oil into the water column (DEIS, p. IV-A-14). Once dispersed in the water, the oil is not necessarily "rapidly diluted," as claimed by the DEIS (p. IV-A-14). Rather, once oil is dispersed in the water column, the toxic components are much more slowly lost than they are from a surface slick (Vandermeulen 1982)."

Obviously this also results in inaccuracies in the impact analysis. Since the DEIS assumes that the toxicity of oil will be very rapidly reduced, it generally considers an oil slick to be damaging only if it encounters an important resource area within 3 days (see the analysis for Port Moller: pp. IV-B-17, IV-B-23, and IV-B-34) or within 10 days (see the analysis for Izembek Lagoon, Moffet Lagoon, Oechevin Bay, and Unimak Pass; pp. IV-B-1) of a spill. Increasing the time of concern to 30 days greatly increases the likelihood of an area coming in contact with oil (Table IV-9 of the DEIS). In fact, the cumulative risk of a spill contacting land within 30 days is estimated at 97% (Table IV-9). MMS does not even attempt to model oil spill behavior beyond 30 days because of the difficulty in doing so (p. IV-A-11), yet the actual time of concern may be many months. This results in a serious underestimate of potential effects, and should be corrected in the FEIS.

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Another concern centors around the effects of photo-oxidation of spilled oil. Oil at sea would be exposed to ultraviolet light - significant amounts in the subarctic summer - which results in photo-oxidation. Photo-oxidation increases the water solubility of hydrocarbons and produces peroxides and phenols as by-products. These compounds are generally much more toxic than the original petroleum and could have an increased impact on
6-126 biological resources.

An important aspect of this is that laboratory toxicity tests are usually conducted under artificial light which is low in UV. Thus, laboratory toxicity tests probably don't account for this process and may well underestimate the toxicity of the oil. For more information on oil toxicity see Howarth (1985a) and (1985b); Tsai and Howarth (1984); and Sanders (1980), copies attached.

Finally, although the DEIS (at IV-A-14; IV-B-11; IV-B-12) does mention that oil might go into the water column and be deposited on the sea floor - which could be a long-term pollution problem

there is no discussion of this in the site-specific analyses for fisheries or marine mammmals. (This aspect is covered more fully in our comments on those sections.) We bring it up here to underscore the point that the RAND model does not account for the nearshore ARCA, nor does it model the movement of oil through the water column. This means that, because of this lack of information, the impact analyses cannot adequately address the impacts to benthic organisms or their predators.

For more information on factors affecting oil transport to the bottom and the possible impacts to fisheries, see: Howarth (1985a) and (1985b); Howarth and Tsai (1984); Howarth (1981); and Sanders (1980); copies attached.

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Response 6-1

Table S-1 presents a summary of overall effects for each topic based on spill statistics and the probability of contact with specific biological resource areas, rather than those effects that may occur under exceptional circumstances or a worst-case scenario. For example, it would be misleading to imply that the occurrence of major effects is equally probable throughout the potentially affected area. However, it also would be misleading to ignore the possible occurrence of a major effect in a specific area or under particular circumstances. The resolution of this problem has taken the form of a set of complementary footnotes that point out the important potential effects of the proposal and the alternatives. To include all of these specific items in the body of the table would tend to confuse the principal intent of the table--to provide an overview of conclusions in the Summary of the document. The placement of certain information in footnotes is a means of making the table comprehensive and should not be interpreted as "relegating" that information to a position of less concern.

Although the general areas that would experience potential major effects (i.e., Port Moller/Nelson Lagoon, Shumagin Islands) also are areas of apparent high probability of oil-spill contact, this parallel relationship requires some interpretation. In the vicinity of Port Moller, the relatively high contact probability (20%) is for the large resource area that extends 25 miles offshore. As explained in Section IV.B.1.a.(2) (of the FEIS), the probability of a spill actually reaching the vicinity of a lagoon entrance is less than 9 percent. Contact probabilities are not available for the southern side of the Alaska Peninsula, but there is a 28-percent probability of spill contact over the entire tanker route from Balboa Bay to ports on the U.S. West Coast over the 26-year life of the field.

Response 6-2

A general statement concerning the purpose and authority of Information to Lessees (ITL's) precedes these measures in Section II.C. These advisory measures serve an important function in alerting the lessees to specific environmental concerns. In most cases, if the lessees conducted operations according to these recommendations, environmental risks would be decreased.

Important elements of Information to Lessees are incorporated into each lessee's Exploration Plan/Oil-Spill Contingency Plan, which is subject to MMS approval. In addition, the Exploration Plan letter of approval reiterates these important elements, which become binding conditions on the lease. In the experience of the MMS, lessees generally have demonstrated good faith by complying with the recommendations contained in these mitigating measures.

Areas of special biological sensitivity are considered in the oil-spill-contingency-plan requirements of OCS Order No. 7, which essentially implies the same enforcement authority as a stipulation. The ITL regarding Bird and Marine Mammal Protection was not made a stipulation. Other agencies (FAA, U.S. Coast Guard) regulate aircraft and vessel corridors. The MMS can only advise lessees concerning the avoidance of bird and marine mammal concentrations.

Response 6-3

Stipulation No. 3 generally applies to operations on the OCS and within the lease area boundaries. Incidents such as overflights of Izembek Lagoon under visual-flight-rule (VFR) conditions emphasize the need for both the MMS and the lessees to assume responsibility for assuring that all contractors and subcontractors are familiar with recommendations contained in the ITL's and to appreciate their importance in maintaining an environmentally sound operation.

Response 6-4

Unimak Pass and the Shumagin Islands have been incorporated into the summary of critical habitat areas in Section III.B.2. of the FEIS, and an analysis of the potential effects is included in Section IV.B.1.a.(2) (see the St. George Basin [Sale 89] FEIS for additional analysis of Unimak Pass).

Response 6-5

The pipeline corridor across the Alaska Peninsula to a pipeline-terminal site at Balboa Bay would not include critical habitat for nesting or migratory birds; thus, any populations using these areas would experience minimal effects. For an analysis of potential effects in Unimak Pass, and of effects that could result from vessel traffic and dredging operations, see Section IV.B.1.a.(2) of the FEIS.

Response 6-6

The text has been amended to address this concern (see Sec. IV.B.1.a.(2) of the FEIS).

Response 6-7

The present understanding of the effect of ingested oil on birds is discussed in several review publications and in numerous specific studies summarized in Section IV.B.1.a.(2), preceding the discussion of site-specific effects. Most studies of the effects of oil on various food organisms have revealed relatively low levels of toxicity. Eelgrass, the principal food of the brant, has been found to recover quickly from exposure to oil. Information contained in the cited references is considered in the analysis of effects on birds.

Response 6-8

The paragraph concerning feeding behavior is substantiated by Geraci's and St. Aubin's (1982) work on oil avoidance in bottlenose dolphins; oil detection by bottlenose dolphins; detection of oil by gray whales; oil ingestion and bioaccumulation in cetaceans; and the work by Kent et al. (1983) on gray whale avoidance of oil. The statements regarding belugas' avoidance of boats do not contradict the following general statement, but rather support it by indicating an example wherein a species responds to one type of noise produced by oil and gas operations. The other noises do not appear to affect belugas in the way that boat noise affects them. The paragraph also points out that other nonendangered cetaceans are attracted to boat noise and, thus, that reactions to noise vary among these nonendangered cetaceans.

A complete discussion of seismic effects on bowhead whales appears in Sec. IV.B.1. of the EIS. The MMS disagrees with the commentor and believes that our conclusion is both accurate and supported by available evidence. In addition, we have included a worst-case analysis of seismic activities on migrating gray whales (Sec. IV.J.)

Response 6-9

The statement of concern reads as follows in the EIS:

> Other potential effects on cetaceans include marine disposal of drilling muds, formation and cooling waters; facility siting; dredging/filling; secondary development and seismic activities. The extent of these activities should not be a major influence on nonendangered cetaceans during exploration.

The Environmental Protection Agency's NPDES permit regulates the amount of discharges into the marine environment at levels the EPA has determined to be unharmful. Therefore, since EPA determines (through the permit process) the discharge levels of drilling muds, formation and cooling waters, and dredge/filling activities, these activities should not have a major influence on nonendangered cetaceans. Facility siting and secondary development must meet the requirements of local planning boards and satisfy CZM requirements. Due to these controls, the aforementioned projects should not have a major influence on nonendangered cetaceans. Finally, seismic activities are permitted through the MMS, which, during the permit-review process, determines if the seismic activity will affect the local species. Special conditions can be added to the permit, if necessary, to ensure compliance with the provisions of the Marine Mammal Protection Act. The dredging in Laguna Guerrero Negro did not result in a decline of calving, only a decrease in use of the lagoon while extensive dredging was ongoing.

Response 6-10

This EIS overstates the effects of oil spills and other potential effects of OCS activities on pinniped species, such as the ice seals, and spotted, bearded, and ringed seals, which rarely occur in the lease sale area (see Graphic 1, which doesn't include northern Bristol Bay) because these species are very unlikely to experience any interaction with OCS oil activities in the lease sale area. The occurrences of some individuals of these species in the lease area, and the possibility of adverse effects on these small numbers of individuals, would represent negligible effects on the regional populations of these species. This EIS emphasizes the species (such as sea otter) that are likely to have some interaction with OCS activities and that could sustain some population-level effect.

Response 6-11

This EIS takes into account the recent decline of the northern (Steller) sea lion population, while the Sale 89 FEIS takes into account the decline of the northern fur seal population, which is more relevant to the St. George Basin lease sales. An analysis of the effects of the lease sale on northern sea lions and northern fur seals is contained in Section IV.B.1.a.(3) (of the FEIS).

The apparent decline in sea lion numbers in the eastern Aleutians is coincidental to population increases of this species in the western Aleutians (Loughlin et al., 1984). The apparent decline in sea lion populations in the eastern Aleutians and in the Gulf of Alaska may represent a shift or seasonal change in distribution of large numbers of sea lions to habitat areas in the western Aleutians and on the southern side of the Alaska Peninsula and west of Kodiak Island, respectively, although interaction with commercial fisheries and losses due to disease may have played a part in the apparent decline (Loughlin et al., 1984). Sea lions are considered quite insensitive to oil spills, regardless of apparent declines or changes in the distribution in the lease area. The estimate of minor effects on sea lions takes into account the severe situation wherein a large number of sea lions may be oiled, and assumes that highly stressed individuals would die as a result (in fact, there is no direct evidence that stressed sea lions would die as a result of oil-spill contact).

The analysis for sea lions contacted by oil takes into account any environmental stressors such as disease, injury, or food depletion that may be associated with interaction with commercial fishing activity. The estimated minor effects on fur seals take into account the very low probability of oil spills contacting significant numbers of fur seals on their foraging grounds west of the lease area (see Sec. IV.B.1.a.(3) [Site-Specific Effects of Oil Spills] and Fig. IV-9 of the FEIS). The number of fur seals contacted by oil is likely to be very small, considering the rapid dispersion of an oil spill and the wide distribution of fur seals into small groups of two to three seals over the foraging grounds. Noise and disturbance sources in the lease sale area would be too far removed from the general distribution of northern fur seals to be of any consequence, regardless of this species' population status.

Response 6-12

This EIS indicates that fur seals could be seriously affected by oil contamination. The discussion in Section IV.B.1.a.(3) (Effects of Oil) of the FEIS states: "Sea otters, fur seals, and newly born seal pups are likely to suffer direct mortality from oiling through loss of fur/water repellency and subsequent loss of thermoinsulation resulting in hypothermia." The study on the effects of oil on polar bears is not relevant to this analysis because polar bears do not occur in the planning area and, therefore, would not be affected.

In regard to the concern over large numbers of fur seals being contacted by an oil spill moving west from the lease sale area, see Response 6-11. Section IV.B.1.a.(3) addresses the cumulative effect of the St. George Basin lease sale on northern fur seals and acknowledges that major effects on northern fur seals are possible.

Response 6-13

There is justification for the assessment that "a maximum of 400 to 700 otters" could be oiled and killed by a 2,000-barrel spill spread over a 100-km^2 area as discontinuous patches of oil (Sec. IV.B.1.a.(3) of the FEIS). The 400 to 700 sea otters represent the best information on sea otter densities in known concentration areas within the lease area. Systematic surveys of sea otter abundance in the planning area have not reported rafts of more than a few hundred animals. A raft of 1,000 sea otters has not been reported recently. This analysis does not assume uniform distribution of sea otters any more than it assumes uniform distribution of oil slicks; however, if the analysis assumes that all 400 to 700 sea otters, or 1,000 sea otters as the commentor suggests, are concentrated in one raft of individuals, the chances of an oil spill contacting this aggregate would be extremely remote. In fact, no sea otters are likely to be oiled in that situation. The 400 to 700 sea otters represent a high-density index of individuals in a large habitat area. The actual numbers of sea otters that could be affected, even assuming that a high-density habitat were contacted, would range from zero to perhaps a few thousand (the latter in the very worst situation). The 400 to 700 aggregate represents a reasonable estimate of the number of sea otters lost to an oil spill or portion of a larger oil spill that may contact a

high-use habitat area. Even the loss of 1,000 sea otters is likely to represent only a moderate effect on the regional sea otter population, the same effect level estimated in this EIS.

Response 6-14

Although startle reactions from noise can have harmful effects on pinnipeds and sea otters other than the disturbance of pupping activities, the number of individuals disturbed is likely to be small for any one interaction with a noise source, such as the two to three helicopter trips per day to the one exploration or two production platforms that would be present in the lease sale area at any one time. A study on the effects of seismic noise and seismic-vessel presences on sea otters by Reidman (1983) (as cited in Bolt, Beranek and Newman, 1984) strongly indicated that this very loud and intense sound source had no effect on sea otters in California waters.

The presence of increasing sea lion and harbor seal populations along the coast of California, where they are subject to heavy marine and air traffic with no apparent adverse effects on populations, strongly suggests that the present source of marine and air traffic (mainly commercial-fisheries boat and air traffic in Bristol Bay) has not had "heavy impacts" on marine mammals, as this commentor suggests. An OCS-related incremental increase in air and boat traffic (3 helicopters/day; 2 to 4 supply-vessel passages/day) is not likely to have more than minor or short-term effects since marine mammals apparently habituate to the presence of this traffic on their feeding grounds. Reidman's review also suggests that oil-industry personnel and their contractors would be diverted from their transportation routes and would pass closer and closer to marine mammals for a better view. The orientations presented to industry personnel in all OCS leasing activities, and the ITL on Bird and Marine Mammal Protection, remind personnel that such actions are in violation of the Marine Mammal Protection Act and Fish and Wildlife Service regulations.

Response 6-15

The DEIS analyzed the effects of tankering oil on pinnipeds and sea otters on the southern side of the Alaska Peninsula. However, an additional statement on the potential effects of tanker transportation has been added to the summaries of effects in Section IV.B.1.a.(3) and Table II-2 of the FEIS.

Response 6-16

The most current data on the effects of seismic activities comes from experiments by Richardson et al. (1984) on bowhead whales, and Malme et al. (1983) on gray whales. The following paragraphs are from Richardson et al. (1984):

Overall, our results show that behavior of bowheads summering in the Canadian Beaufort Sea is not altered in a conspicuous, consistent manner by noise from seismic vessels 6 km or more away, or by a single airgun simulating such a vessel. Reeves et al. (1983) obtained similar results from bowheads feeding and migrating in the Alaskan Beaufort Sea in late summer and autumn.

This lack of detectable reactions by bowheads is not necessarily inconsistent with the results of Malme et al. (1983), who found that migrating gray whales sometimes react to seismic noise. Definite reactions by gray whales were found only when 'average pulse level' was at or greater than 160 dB/1 micro Pascal, i.e., peak levels at or greater than 170 dB. We have not observed bowheads exposed to such strong seismic signals. Peak received levels were 150 dB for bowheads 6-8 km from a seismic boat in shallow water (Fraker et al., 1982). Similarly, almost all Alaskan observations of bowheads exposed to seismic noise were at or greater than 6 km from seismic boats, so received levels were probably less than 160 dB.

Response 6-17

The uncertainty of effects on whales is addressed in Section IV.J. (Worst-Case Analysis) of the EIS.

Response 6-18

The quotation taken by the commentor from Thorsteinson (1984) refers to migration rates for outmigrating juvenile salmon. The text of the EIS (Sec. III.B.1.), however, discusses spawning-migration rates as summarized in Thorsteinson: "Straty (1981) estimated migration rates from the shelf edge (200-m isobath) to the mouth of the Kvichak River, a distance of 1,259 km, during the last 30 days of the spawning migration to be 45 km/d for sockeye and chum; 56 km/d for chum and coho; and 60 km/d for chinook."

Response 6-19

Information summarized in Section IV.B.1.a.(1) (from Thorsteinson, 1984) is very general life-history information that applies to the five species in the area. Although specific information on juvenile outmigration routes and timing has been described in some detail only for sockeye, this section does not summarize but rather presents a broad overview of life-history characteristics.

Response 6-20

Figure III-6 has been moved to the sockeye salmon subsection of Section III.B.1. in the FEIS. Although the broken arrows in Figure III-6 indicate "direction of probable migration," these arrows are

on the northern portion of Bristol Bay, in Norton Sound, and farther north. Outmigration along the northern side of the Alaska Peninsula (including fish from Nushagak Bay and Kvichak Bay) is indicated by the two arrows leading into the bands of shading that indicate relative abundance during the seaward migration along the northern side of the Alaska Peninsula.

Response 6-21

The text has been amended to reflect this information regarding major sockeye runs (Sec. III.B.1. of the FEIS). Harvest data are presented in Section III.C.1.

Response 6-22

The unbroken arrows on Figure III-7 of the FEIS (Fig. III-6 of the DEIS) (Thorsteinson, 1984) indicate known migration routes. Based on this figure, the chinook spawning-migration route was summarized very generally as "some distance offshore through the Bering Sea toward their natal streams along the Alaska Peninsula and Bristol Bay (Fig. III-6)" in the DEIS. Although the information on migration routes is general (i.e., lacking specific detail), it is not hypothetical for the area described in Section III.B.1.

Response 6-23

The text has been amended to include a reference for the statement on spawning substrates (Sec. III.B.1. of the FEIS).

Response 6-24

The commercial value of capelin is not discussed in Section III.B.1. (Fisheries Resources) (see Sec. III.C.1. [Commercial Fishing Industry]).

Response 6-25

These concerns are addressed in Response 1-3.

Response 6-26

The derivation of a 200-square-kilometer area for a 100,000-barrel spill is given in Section IV.A.3.e. A 100,000-barrel crude spill in subarctic waters would physically cover up to 20 km^2 (Sec. IV.A.3.e.). The actual area covered by the slick would be about tenfold greater, with 90 percent of the slick surface being open water rather than oil. The commentor overlooks two major points. First, arctic and subarctic crude spills are orders of magnitude thicker than spills of the same crude in more temperate waters. Therefore, they also must be orders of magnitude smaller in area to make up for the additional thickness. Second, the commentor is confusing the area swept by a slick as it moves across the ocean or along a shoreline with the maximum area actually physically covered by that slick at any one time.

Response 6-27

The MMS believes that the derivation of the 200-km^2 area for a 100,000-barrel spill, which is provided in Section IV.A.3.e. and Response 6-26, is accurate for water in the southeastern Bering Sea. Because we believe this derivation is accurate, effects on fisheries resources from a 100,000-barrel spill will be based on the 200-km^2 area.

Response 6-28

An effects analysis (for example, Effects on Salmon) shows that both local and regional effects are examined. The difference between local and regional effects is due to the specific situation in each case. Levels of effects are measured on the same scale. The analysis for fisheries resources is based on the definitions presented in Table S-1, and these definitions focus on regional populations rather than local stocks. Based on these definitions, minor to moderate effects on regional populations of fisheries resources could be expected; however, serious localized effects could occur on localized stocks that constitute a portion of the regional populations. The analysis evaluates the potential effects in the event that a spill contacts a nearshore area. Based on combined probabilities, however, this appears unlikely. The analysis further assumes that vulnerable lifestages would be present when a spill contacted the nearshore area.

The analysis in the EIS does not support such findings that major effects would occur to the Naknek/Kvichak River system stocks because oil spills are not expected to contact areas where these stocks concentrate.

For the purpose of analysis in the EIS, we assume that the population of herring in the southeastern Bering Sea is the regional population. We have acknowledged that localized effects on herring could be serious.

Response 6-29

The reported hydrocarbon concentrations of 0.210 ppm down to a depth of 20 meters and 0.100 ppm down to a depth of 100 meters have been incorporated into the analysis in Section IV.B.1.a.(1) of the FEIS.

Response 6-30

The statements on Page IV-B-2 in the DEIS as to a week or 10- to 12-day persistence for aromatics from the slick were based on

assumptions made during an early St. George Basin synthesis meeting in April 1981, assumptions now recognized as overly conservative by the original authors.

The St. George synthesis meeting occurred prior to completion of OCSEAP studies and in situ measurements of subarctic weathering by Payne (1981, 1982, 1984). Payne demonstrated that for individual compounds, a significant decrease in slick concentrations takes hours to tens of days. Because of this difference in loss rates and because the bulk of these low-molecular-weight compounds is lost within 3 days, a January 1982 NOAA OCSEAP/Alaska OCS Office BLM workshop of oil-spill weathering and modeling in Alaskan waters considered 3 days to be the appropriate time period to use as the duration for initial higher toxicity of a spill.

Highest rates of dissolution of aromatics from a slick, and consequent accumulation in underlying water, occur in the first few hours after a spill (Payne, 1981). At sea, water depth and shoreline do not restrict movement of slick or water, and the slick and underlying water generally move in different directions. Thus, at sea, the water under the slick changes continuously and aromatics do not continue to accumulate in the same water.

Duration of aromatic concentrations in the water column is a separate question from duration in the slick. Concentrations of aromatics decrease continuously within a slick, as stated above, with most aromatics being lost within 3 days. Concentrations within the water column depend upon the depth and rate of vertical mixing, the size of the spill, rates of horizontal mixing, and advection. The differing directions and rates of movement of slick and water limit the contact time and, therefore, concentrations of dissolved hydrocarbons in the water of the open sea.

Cline (1981) studied dispersion of dissolved hydrocarbons in Bristol Bay and developed a dispersion model based on the observed decreases in dissolved hydrocarbon concentrations with distance from the source. Based on this model and the observations of dissolved hydrocarbons, concentrations would be reduced tenfold within 12 kilometers from the input source, hundredfold within 80 kilometers, and thousandfold within 520 kilometers. These estimates ignore any losses of dissolved hydrocarbons to the atmosphere that would further decrease dissolved hydrocarbon concentrations (Cline, 1981).

Note that in the above analysis, the decrease in water column concentrations is by dispersion, that is by mixing and dilution, not by removal of the hydrocarbons from the water. The commentor should be aware that there is a difference between dilution and physical removal of hydrocarbons from the ecosystem; i.e., the reference to Vandermeulen (1982). Once diluted, degradation of dissolved hydrocarbons will be slow, partly because microbial decomposition is slower at lower substrate concentrations. However, toxicity is better related to high concentrations of hydrocarbons than to persistence of very low concentrations.

Although toxicity can be increased by photo-oxidation, there are two very important considerations that minimize the effects of this increased toxicity. Photo-oxidation is a surface phenomenon; the ultraviolet does not reach very deeply into the ocean or into a surface slick, particularly the thicker slicks to be expected in the subarctic and arctic (see Response 6-124). Also, photo-oxidized toxics are slow and no appreciable accumulation of such toxics would be expected in the open sea. Also note that studies by Payne (1981, 1984) referenced in the EIS were conducted out of doors, under in situ subarctic conditions.

Response 6-31

The use of LC_{50} values has been amended in the analysis in the FEIS to reflect the fact that they represent concentrations at which 50 percent of the exposed organisms were killed in tests. The analysis acknowledges that the LC_{50} values are based on laboratory exposures, and they cannot be applied to predict precise effects on specific organisms in situ, but rather as a general measure of what effects might be expected on related species or groups of species.

Response 6-32

The possible effects on fish larvae are not underestimated. In the EIS, the assumption is made (conservatively) that lethality will occur to these lifestages upon contact by oil dissolved in the water column, regardless of concentration. Table IV-14 merely indicates observed ranges of concentration that have produced effects in laboratory bioassay studies. The EIS does not imply that these concentrations (LC_{50} from laboratory exposures) are threshold values for effects produced in the natural environment.

Response 6-33

This concern is addressed in Responses 6-31 and 6-32.

Response 6-34

Conditional probabilities assume that an oil spill has occurred at a specific location (launch point) irrespective of the transportation scenario and oil resources assumed to be present in the basin. Final probabilities take into consideration the amount of oil resources assumed to be present and the transportation scenarios to portray the probability of an oil spill occurring and contacting a specific location (target) from all launch points specified in the

OSRA model. Thus, final probabilities are better representatives of the risk to a given target from developing the estimated resources. Refer to Response 3-2 for an additional discussion of this concern.

Response 6-35

As indicated in Response 4-14, an oil-spill-trajectory analysis for the southern side of the Alaska Peninsula is not available at this time. However, lacking an oil-spill-trajectory analysis, the MMS took a conservative approach to analysis and assumed that an oil-spill occurred and contacted nearshore areas when vulnerable lifestages of fish species were present. Oil-spill statistics for the southern side of the Alaska Peninsula are presented in Section IV.A.3.b.

Response 6-36

While the EIS acknowledges that the knowledge of sublethal long-term effects of exposure to drilling fluids and cuttings is incomplete, it goes on to state what is known concerning these effects (Sec. IV.B.1.a.(1)). Further on in this section, the analysis concludes that effects from these discharges would be minor based on the limited area affected by these discharges.

Response 6-37

The use of explosive seismic-energy sources in the North Aleutian Basin is not anticipated. A discussion of seismic-energy sources used for prior seismic surveys in the North Aleutian Basin is provided in Section I.D.2.c., and the recommended language has been added in the FEIS.

Response 6-38

This concern is addressed in Responses 6-26 and 6-27.

Response 6-39

The text (Sec. IV.B.1.a.(1) of the FEIS) has been amended to cover this concern.

Response 6-40

The text (Sec. IV.B.1.a.(1) of the FEIS) has been amended by deleting the contradictory statement.

Response 6-41

This discussion is designed to present examples of benthic contamination that have been observed from past spills. In addition to the example from the North Sea cited by Ward et al. (1980), there is another observation where there was little contamination of benthic sediments following the Argo Merchant spill (Macleod et al., 1978).

In addition, the observation by Addy et al. (1978) is included in the EIS. The apparent contradiction has been resolved by revising the text (see Response 6-40).

Response 6-42

The text (Sec. IV.B.1.a.(1) of the FEIS has been amended to address this concern.

Response 6-43

The text (Sec. IV.B.1.a.(1) of the FEIS) has been amended to address this concern.

Response 6-44

Use of LC_{50} values has been amended in the analysis (in the FEIS) to reflect the fact that they represent concentrations at which 50 percent of the exposed organisms were killed.

Response 6-45

This concern is addressed in Responses 6-26 and 6-27.

Response 6-46

This concern is addressed in Responses 6-26 and 6-27.

Response 6-47

The text (Sec. IV.B.1.a.(1) of the FEIS) has been amended to address this concern.

Response 6-48

The MMS does not agree that the evaluation of effects of an offshore oil spill on pelagic adult salmon was based on a number of inaccurate assumptions. The commentor has not provided the essential rationale to support a major effect for pelagic salmon. Response 6-26 refutes the argument that the area (200 km^2) understates the total area affected by a 100,000-barrel spill. Response 6-30 refutes the argument that oil would remain toxic in the water column for long periods. The EIS does not assume that lethal toxicity will not occur at concentrations below LC_{50} values (Response 6-32).

Response 6-49

This concern is addressed in Responses 6-26 and 6-27.

Response 6-50

This concern is addressed in Response 6-28.

Response 6-51

This concern is addressed in Response 6-31.

Response 6-52

The text (Sec. IV.B.1.a.(1) of the FEIS) has been clarified.

Response 6-53

This concern is addressed in Responses 6-31 and 6-32.

Response 6-54

This concern is addressed in Response 6-30.

Response 6-55

The text (Sec. IV.B.1.a.(1) of the FEIS) has been amended to address this concern.

Response 6-56

The text (Sec. IV.B.1.a.(1) of the FEIS) has been amended to address this concern.

Response 6-57

This concern is addressed in Responses 6-26 and 6-27.

Response 6-58

The text (Sec. IV.B.1.a.(1) of the FEIS) has been amended to address this concern.

Response 6-59

The MMS does not agree with the point upon which the UFA bases a conclusion of major effects on salmon. Each of those points is addressed below.

The probability of an oil spill occurring and contacting nearshore areas is not high. The final probabilities of an oil spill of 1,000 barrels or greater contacting the Nelson Lagoon and Port

Moller/Bear River areas are 9 and 3 percent, respectively. Probabilities for nearshore areas in inner Bristol Bay are less than 0.5 percent.

The derivation of a 200-km^2 area for a 100,000-barrel spill is given in Section IV.A.3.e. A 100,000-barrel crude spill in subarctic waters would physically cover up to 20 km^2 (Sec. IV.A.3.e.). The actual area covered by the slick would be about tenfold greater, with 90 percent of the slick surface being open water rather than oil. The commentor overlooks two major points. First, arctic and subarctic crude spills are orders of magnitude thicker than spills of the same crude in more temperate waters. Therefore, they also must be orders of magnitude smaller in area of makeup for the additional thickness. Second, the commentor is confusing the area swept by a slick as it moves across the ocean or along a shoreline with the maximum area actually physically covered by that slick at any one time.

In the analysis, both local and regional effects are examined. The difference between local and regional effects is due to the specific situation in each case. Levels of effects are measured on the same scale. The analysis for fisheries resources is based on the definitions presented in Table S-1, and these definitions focus on regional populations rather than local stocks. Based on these definitions, minor to moderate effects on regional populations of fisheries resources could be expected; however, serious localized effects could occur on localized stocks that constitute a portion of the regional populations. The analysis evaluates the potential effects in the event that a spill contacts a nearshore area. Based on combined probabilities, however, this appears unlikely. The analysis further assumes that vulnerable lifestages would be present when a spill contacted the nearshore area.

V-136

The analysis in the EIS does not support such findings that major effects would occur to the Naknek/Kvichak River system stocks because of the low probabilities of oil-spill contact to areas where these stocks concentrate (less than 0.5%).

For the purpose of analysis in the EIS, we assume that the population of herring in the southeastern Bering Sea is the regional population. We have acknowledged that localized effects on herring could be serious.

The EIS concludes that no avoidance or delay of migrating adult salmon is likely to occur, because concentrations of dissolved hydrocarbons at levels at which adult salmon have demonstrated avoidance behavior would not be expected from an offshore oil spill. A nearshore pipeline spill in the vicinity of Port Moller could produce higher concentrations of hydrocarbons near the mouths of spawning streams around Herendeen Bay (Sec. IV.B.1.a.(1) of the

FEIS). However, these concentrations would diminish within a limited time period (10 days). Concentrations of dissolved hydrocarbons would still not approach the demonstrated avoidance threshold.

The effects of oil are assumed to result in mortality and sublethal effects on eggs, which may affect their ability to survive, develop, or reproduce. These factors are addressed in the analysis in the FEIS (Sec. IV.B.1.a.(1).

Response 6-60

This concern is addressed in Response 6-59.

Response 6-61

This concern is addressed in Responses 6-26 and 6-27.

Response 6-62

In the text (Sec IV.B.1.a.(1) of the FEIS), the information on outmigrating juvenile salmon has been clarified as being specific only to sockeye. Use of LC_{50} values has been amended in the analysis to reflect the fact that they represent concentrations at which 50 percent of the exposed organisms were killed in tests.

Response 6-63

This concern is addressed in Response 6-28.

Response 6-64

This concern is addressed in Response 6-28.

Response 6-65

The text (Sec. IV.B.1.a.(1) of the FEIS) has been amended to address this concern.

Response 6-66

This concern is addressed in Response 4-74.

Response 6-67

Final probabilities are more appropriate representations of risk than conditional probabilities; therefore, they do not "downplay" the risks (refer to Response 6-34). Oil is not anticipated to remain toxic for long periods (refer to Response 6-30).

Response 6-68

Pink and chum salmon are more likely to be affected by an oil spill contacting Izembek/Moffet Lagoons and Bechevin Bay than sockeye and coho salmon because they can spawn intertidally.

Response 6-69

Final probabilities indicate that there is a 0.5-percent-or-lower probability of an oil spill occurring and contacting Unimak Pass within 30 days. This indicates an extremely remote chance of oil-spill contact in this area. Therefore, no effects are expected on salmon migrating through Unimak Pass.

If an oil spill occurred and contacted Unimak Pass, hydrocarbon concentrations in open-water areas might be similar to the 0.1 to 0.21 ppm concentrations documented following oil spills (Marchard, 1978; Vandermuelen, 1982) which would result in a limited number of mortalities on adult and juvenile salmon (which have LC_{50} values of 1 to 3 ppm), rather than lethal effects on a large portion of the salmon migrating through the pass (as purported by UFA). Furthermore, salmon stocks are segregated over time, so a spill that remained toxic in Unimak Pass for several days would contact only a portion of the migrating salmon. Consequently, a major effect would not result.

Response 6-70

As indicated in Response 4-14, an oil-spill trajectory analysis is not available at this time. However, lacking an oil-spill-trajectory analysis, the MMS took a conservative approach to analysis and assumed that an oil-spill occurred and contacted nearshore areas when vulnerable lifestages of salmon were present.

Response 6-71

This concern is addressed in Responses 6-30, 6-48, and 6-59.

Response 6-72

The text has been amended to incorporate the information in this comment (Sec. IV.B.1.a.(1) of the FEIS).

Response 6-73

The text (Sec. IV.B.1.a.(1) of the FEIS) has been amended to address this concern.

Response 6-74

This concern is addressed in Responses 6-26, 6-28, and 6-31.

Response 6-75

The cumulative-case effect is expected to be minor, which is the same as the overall effect expected for the proposal.

Response 6-76

The paragraph cited by the commentor does not deal with final probabilities, but rather with a statistical projection of the number of 1,000-barrel-or-greater oil spills that could occur over the life of the project. The MMS feels that it is important to indicate the number of oil spills that could affect herring in and adjacent to the North Aleutian Basin.

Response 6-77

The probability of an oil spill occurring and contacting Port Moller is 17, 20, and 24 percent within 3, 10, and 30 days, respectively. The probability of an oil spill occurring and contacting Port Moller when susceptible lifestages are present would be lower than the probabilities stated above. The conditional probability (99.5%) is not an appropriate measure of risk from the 1 oil spill expected to occur from this proposal (refer to Response 6-34). Therefore, the MMS does not agree that major effects are likely.

Response 6-78

As reflected in the text (Sec. IV.B.1.a.(1), the oil-spill-risk analysis (OSRA) data indicate that there is a final probability of less than 0.5 percent that an oil spill of 1,000 barrels or greater would occur and contact land segments between the Egegik Bay and the Kuskokwim Bay within 30 days. The conditional probabilities indicate that, if a spill occurred, there would be a less-than-0.5-percent probability of contact for the area between Egegik Bay and Kuskokwim Bay for 3-, 10-, and 30-day trajectories.

Response 6-79

The reference "high" has been deleted from the text.

The statement that, "These data reveal that the risk of oil-spill contact and subsequent effects on nearshore areas being used by spawning herring in the vicinity of Port Heiden is remote," is borne out by the OSRA data. The final OSRA probabilities indicate a 0.5-percent chance of a 1,000-barrel-or-greater oil spill contacting the Port Heiden area, after 10 days, and a 5-percent probability after 30 days. These probabilities reflect the expected oil-spill risks based on the mean resource of 364 MMbbls of oil for the North Aleutian Basin. The conditional probabilities reveal a less-than-0.5-percent probability of contact within 10 days and a 25-percent probability of contact within 30 days. However, conditional probabilities are not based on the mean-resource level for the lease sale area.

Response 6-80

The reference to "relatively high" has been deleted from the text.

Response 6-81

Conditional probabilities represent the probability of oil from all spill points (Graphic 5) contacting an area, given an oil spill. In assessing the potential effects of the proposal, final (combined) probabilities provide a more accurate assessment of the oil-spill risk to resources. Final probabilities consider the probability of a spill occurring, the lease sale area's resource estimate, public information on the resource prospect, and the transportation scenario. Because of the above, the MMS feels that combined probabilities are a more appropriate indicator of oil-spill risk resulting from the proposal than are conditional probabilities.

The combined probabilities indicate that, for a 1,000-barrel-or-greater oil spill, the Port Heiden area has a 5-percent probability of being contacted within 30 days. Port Moller has a 24-percent probability of being contacted within 30 days.

Given that oil-spill statistics indicate that 0.94 oil spills of 1,000-barrels or greater could be expected, it is highly unlikely that both Port Heiden and Port Moller would be contacted by a single spill.

The text has been amended in the FEIS to address the concern over possible amelioration of herring stock losses through recruitment.

Response 6-82

As indicated in Response 4-14, an oil-spill-trajectory analysis is not available at this time for the southern side of the Alaska Peninsula.

Herring populations of the southern coast of the Alaska Peninsula spawn in sheltered bays and inlets. An oil spill that contacted spawning adults, their eggs, and the larvae as a result of a tanker accident would be the sole effector as a potential result of this proposed lease sale. Tanker routes, for the most part, are in open-ocean areas with little or no danger of grounding and loss of oil. Other factors, such as collisions, could cause loss of oil; but it is not likely that even a large spill exceeding 100,000 barrels could enter a bay or inlet and have an effect on herring.

Response 6-83

The rationale used in this comment to support a major effect on herring is incorrect. The EIS assumes that oil contact to herring eggs and larvae would produce 100-percent mortalities within the area contacted. However, the probabilities, of an oil spill (1,000-barrel-or-greater) occurring and contacting herring spawning areas around Port Moller and Port Heiden are 24 and 5 percent, respectively, within 30 days. On the basis of those probabilities, the EIS concludes that effects on the herring resources would be unlikely. However, if an oil spill did occur and contact these areas, a moderate effect on herring resources would occur. The commentor is referred to Responses 6-28 and 6-34 for additional discussion on these points.

Response 6-84

This concern is addressed in Response 6-83.

Response 6-85

This concern is addressed in Responses 6-26 and 6-27.

Response 6-86

This concern is addressed in Responses 6-26 and 6-27.

Response 6-87

This concern is addressed in Responses 6-26, 6-34, and 6-59.

Response 6-88

This concern is addressed in Responses 6-26 and 6-27.

Response 6-89

The text (Sec. IV.B.1.a.(1) of the FEIS) has been amended to address this concern.

Response 6-90

The MMS disagrees with the conclusions of the commentor regarding the effects on groundfish. The commentor is referred to Responses 6-26, 6-34, and 6-59.

Response 6-91

The concern regarding lethality of 3 to 5 ppm on adult groundfish is discussed in Response 6-31. A discussion of the derivation of the 200-km^2 area is presented in Response 6-26. Because the oil-spill risk in the cumulative case does not increase over that of the proposal, effects on vulnerable lifestages in nearshore areas are expected to be the same as for the proposal (as referenced in the text).

Response 6-92

As indicated in the text (Sec. IV.A.3.b.), the combined probabilities for oil spills do not increase for nearshore areas north of the Alaska Peninsula and around Bristol Bay, which are used by the most vulnerable lifestages of groundfish. Because of this, the effects of the cumulative case in nearshore areas, which are used by egg, larval, and juvenile lifestages of numerous groundfish species, would be the same as for the proposal.

Response 6-93

This concern is addressed in Responses 6-26 and 6-27.

Response 6-94

This concern is addressed in Response 6-31.

Response 6-95

This concern is addressed in Response 6-26.

Response 6-96

As indicated in Response 4-14, an oil-spill-trajectory analysis is not available at this time for the southern side of the Alaska Peninsula. However, lacking an oil-spill-trajectory analysis, the MMS took a conservative approach to analysis and assumed that an oil spill occurred and contacted nearshore areas. Oil-spill statistics for the southern side of the Alaska Peninsula are presented in Section IV.A.3.b.

Response 6-97

The MMS agrees with the UFA's comments on the sentence in question, except for the statement that the area extent of a 100,000-barrel spill could be much larger than 200 km². The derivation of a 200-km² area for a 100,000-barrel spill is provided in Response 6-26 and Section IV.A.3.e. of the EIS.

Response 6-98

This concern is addressed in Responses 6-26 and 6-28.

Response 6-99

The proposed lease sale would have the potential to affect surf clam resources on the southern coast of the Alaska Peninsula only in the event that a large oil spill resulting from a tanker accident contacted the nearshore spawning habitats for this species during the very limited annual spawning time. Surf clams, however, like many mollusk species, produce large numbers of eggs, ranging

into the millions per female. Further, the species is widely distributed from arctic waters to Puget Sound. The probability of even a very large oil spill, in excess of 100,000 barrels, affecting a significant segment of the Alaskan surf clam populations is negligible.

Response 6-100

The reference to "very low," in relation to the oil-spill risks to surf clam populations in the Cape Senviavin-to-Port Heiden area, has been deleted.

Response 6-101

This concern is addressed in Response 6-31.

Response 6-102

The MMS agrees with the UFA's comments on the sentence in question, except for the statement that the areal extent of a 100,000-barrel spill could be much larger than 200 km². The derivation of a 200-km² area for a 100,000-barrel spill is provided in Response 6-26 and Section IV.A.3.e. of the EIS.

The FEIS indicates that a major spill that contacted the Port Moller/Port Heiden area when ovigerous females, larvae, and juvenile red king crab were concentrated in nearshore waters could result in a serious reduction of the currently depressed population (i.e., a major effect).

Response 6-103

As indicated in Response 4-14, an oil-spill-trajectory analysis is not available for the southern coast of the Alaska Peninsula. Tanner crab are distributed widely off the southern coast of the Alaska Peninsula. Based on Alaska Department of Fish and Game (ADF&G) catch statistics for the 1981-82 tanner crab season, a total of 1,754,000 tanner crab were harvested on the southern coast of the Alaska Peninsula; of this total, only 47,416 tanner crabs--about 3 percent of the total--were caught in Beaver/Balboa Bays. This would seem to show that a relatively small part of the tanner crab resource on the southern coast of the Alaska Peninsula could be contacted by an oil spill in this area (ADF&G, 1983, "Westward Region Shellfish Report to the Alaska Board of Fisheries").

Response 6-104

Response 6-21 and Section IV.A.3.e. of the text explain the derivation of the 200-km² area for a 100,000-barrel spill. The reference to "limited juvenile and adult mortality" has been deleted from the text.

Response 6-105

The rationale for using combined probabilities as indications of oil-spill risk is identified in Response 6-59.

The text has been modified to indicate that ". . . within 3 days while hydrocarbon concentrations are likely to be high enough to cause mortality to all lifestages of red king crab" (Sec.IV.B.1.a.(1) of the FEIS).

Response 6-106

The text (Sec. IV.B.1.a.(1) of the FEIS) has been amended to address this concern.

Response 6-107

An oil spill of the 100,000-barrel-or-greater class has a 3-percent probability of occurring. Combined probabilities indicate that a 100,000-barrel-or-greater spill has a 1-percent probability of contacting Port Moller (Resource Area 6) and a less-than-0.5-percent probability of contacting Port Heiden (Resource Area 6) within 30 days. The use of combined probabilities is a far more accurate indicator of risk than conditional probabilities. A discussion of the rationale for using combined probabilities is provided in Response 6-28.

The text (Sec. IV.B.1.a.(1) of the FEIS) has been modified to include separate analyses for red king crab and other invertebrates. The analysis concludes that a major spill (100,000 barrels) contacting nearshore areas when vulnerable lifestages are present could result in major effects on red king crab and a moderate effect on other invertebrates.

Response 6-108

This concern is addressed in Response 6-107.

Response 6-109

This concern is addressed in Response 6-107.

Response 6-110

The LC_{50} value for adult crabs is 1 to 4 ppm (Table IV-13) and not 0.1 ppm, as the commentor implies. Further discussion of the use of LC_{50} values is presented in Response 6-31.

Response 6-111

This concern is addressed in Responses 4-14, 6-26, and 6-27.

In addition, the MMS does not agree that the oil-spill-risk analysis is flawed. The Rand oil-spill-trajectory model has been used in a total of seven other oil-spill-risk analyses to date (Sales 57, 70, 83, and 87, and proposed Sales 89 and 100). In these seven studies, each spill point within the proposed lease sale areas has represented an average of 176 lease blocks. The density of spill points in this (Sale 92) analysis is 2.3 times greater than this overall average, with each spill point representing only 76 lease blocks. Additional spill points do not increase the risk; rather, they dilute the risk to individual targets and land segments. This is partly because the probability of overall spill occurrence is fixed; thus, adding spill points cuts the risk of spillage from all other spill points.

Simulation error (Monte Carlo error) is a function of the number of trajectories and estimated probability, as indicated by the commentor. However, as evident from Table 2 of Labelle (1985), the error range for conditional probabilities used in this EIS is ±3 percent at very low or very high probabilities, to about ±11 percent for the middle of the probability range. For combined probabilities, simulation error is a function of all trajectories run from all hypothetical launch points; for the proposal, this error is reduced to ±1 to 3 percent of probability values. These error ranges are similar to those encountered in the oil-spill-risk analyses for Sales 57, 70, 83, and 87, and proposed Sales 89 and 100.

The OSRA for this proposed sale has a total of 37 sea targets and 200 land/boundary segments. Most MMS OSRA runs are limited to a maximum of 31 nonland targets and 100 land/boundary segments.

Nearshore targets are best represented by land segments, which count a trajectory as a contact if it reaches within 1 to 3 kilometers of shore. Biological resources that are not site-specific should not be represented by fixed-location targets. The potential effects on such resources should be discussed in the context of what portion of the resource population could be contacted by a spill or spills throughout the study area.

Both ice-free areas and ice-free conditions were simulated. During the winter period, the Bering Shelf is only partially covered with ice. The marginal ice zone in the model was schematized approximately from Cape Navarin southeastward to Point Moller, based on the long-term, observed ice limits. Ice-production areas near the coast also are ice-free.

The process of oil moving under ice at a launch point and subsequently moving into deeper, warmer water accompanied by ice melt, is included in the model. For example, for a spill near the marginal ice zone east of St. George Island, if winds from a given weather scenario blew primarily from the north-northeast, the oil would travel initially with the ice toward the southwest into the deeper, warmer waters. Subsequent movements of the oil would be over ice-free water after the ice melted. On the other hand, if the winds of a weather scenario were primarily from the east, the oil would travel with the ice within the marginal ice zone. Under this condition, the oil would travel a greater distance toward the northwest because the shear stress between air and ice is much greater than air over water. This is particularly true in the marginal ice zone when wind waves are somewhat dampened by the presence of loose ice. By the same token, when oil travels with the ice, the drift directions are more sensitive to modeled (or real) storms passing through the area.

This concern also is addressed in Response 4-14.

Response 6-112

This concern is addressed in Responses 1-48, 4-3, and 4-15.

In addition, the MMS does not assume that field operations in Alaskan waters are similar to existing field activities elsewhere. The MMS assumes that field operations are modified to meet local environmental conditions. For example, exploration plans are reviewed against local-environmental-hazard information, not against California or Gulf of Mexico information. Platforms would be designed to meet local Alaskan conditions, not California or Gulf of Mexico conditions. As long as a Gulf of Mexico platform is designed to survive a 100-year Gulf of Mexico storm and a Bering Sea platform is designed to survive a 100-year Bering Sea storm, the likelihood of either platform not surviving should, in theory, be equal. In practice, industry may be overdesigning Alaskan structures; in Cook Inlet, industry has produced 0.8 Bbbls since the mid-1960's without a platform spill. However, our OCS statistics give an expected number of 1.79 spills, with only a 17-percent chance of having zero spills (see Sec. IV.A.3.b.).

V-141

Response 6-113

The MMS does not use Alaskan, non-OCS spill statistics to calculate oil-spill risk. The summary of Alaskan spill statistics has been included in the EIS as a response to frequent requests that these statistics be portrayed, and to counter the misconception that Alaskan environmental conditions result in more frequent oil-industry spillage.

The commentor gives no statistical basis for the premise that "Characteristically the years of declining production are also years of declining spill rates." Such a premise is inconsistent with either OCS or Alaskan spill records. Both Alaskan and OCS records indicate a decrease in spillage rates since the early 1970's, regardless of whether the individual fields were decreasing or increasing in production. If the commentor's premise were correct, it would mean that the EIS overestimates the true spill

rate for Cook Inlet by extrapolating over only the first part of the life of the field. The commentor should be aware that a necessary corollary to this argument is that OCS statistics overestimate Alaskan oil-spill risk.

The commentor offers no statistical support for the claim that onshore oil fields are less hazardous in relation to oil spills than offshore fields. The Alaskan statistics in Section IV.A.3.b. of the EIS list 1 to 3 platform spills for Prudhoe Bay/Kuparuk and zero spills for Cook Inlet. The spillage rate for OCS offshore pipelines is 3 times less than for U.S. onshore pipelines when compared on a number-of-spills-per-pipeline-mile basis (USDOD, Army Corps of Engineers and Environmental Research and Technology, Inc., 1984). Tankering of Prudhoe Bay/Kuparuk oil at the far end of the pipeline is via at-sea routes, as is all OCS tankering.

Reporting requirements for tanker spills are based on international treaties and conventions and are quite similar. The reporting requirement for foreign tankers and U.S. tankers is not a function of vessel nationality, but rather of into whose waters the tanker is spilling oil. The use of Alaskan crude-oil-tankering statistics would result in lower, but not significantly lower, spill projections than would the use of international tanker statistics.

Response 6-114

The pipeline-transportation scenario for the proposal would pipe North Aleutian Basin oil to a terminal on the southern side of the Alaska Peninsula, where it would be tankered through the Gulf of Alaska--not through the Bering Sea (also see Response 4-14). Industry has tankered over 4 Bbbls of North Slope crude through the Gulf of Alaska without a major tanker spill in the Gulf. The MMS does not agree with the logic expressed by the commentor, which would require that the EIS substitute this historical, local spill rate in place of worldwide statistics. Such a substitution would require the EIS analysts to assume that tankers carrying North Aleutian crude would have zero spills. The EIS also has included an offshore-loading-transportation scenario for Alternative I. Oil would be offshore loaded and transported by tankers through Unimak Pass to markets. The oil-spill-risk analysis for this transportation scenario is contained in Appendix G.

Response 6-115

The text has been expanded to include more information on the stochastic wind model used in the oil-spill-trajectory modeling Sec. IV.A.3.c. of the FEIS. However, the reader is referred to Liu and Leendertse (1981a,b; 1983a,b) for additional details on the sources of weather data used in the model.

Response 6-116

The meteorological and oceanographic data bases used in the oil-spill-trajectory analysis are updated as new information becomes available. Much of the data compiled from the Bering Sea Offshore Comprehensive Oceans Measurement Program is of a proprietary nature and is not available to the MMS. The data that is nonproprietary is en route to the National Ocean Data Center (NODC) for archiving. MMS contractors have requested this information; once it is released by the NODC, the appropriate data bases will be updated. The lack of specific data in the existing data base does not, however, detract from the validity of the existing data or from the results derived from that data (see also Response 6-115).

Response 6-117

The orographic effect was considered by Schumacher and Moen (1983) to be more important on the southern side of the Alaska Peninsula than on the northern side. This difference in importance across the peninsula is one reason why the inclusion of orographic effects is more relevant to trajectories for the southern side of the peninsula than within Bristol Bay. In addition, Schumacher and Moen considered the orographic effect to be directed predominantly offshore north of the Alaska Peninsula and to be more important at Cold Bay and Unimak Pass than at Port Moller and elsewhere along the northern side of the Alaska Peninsula.

What this implies about the trajectory model results is quite clear: where these orographic effects occur (particularly at Cold Bay and Port Moller), the model will slightly overestimate the likelihood of land or nearshore contacts. The orographic winds on the northern side of the Alaska Peninsula would tend to direct a real spill farther offshore. Note, however, that this additional shoreline protection is minute; the orographic winds rapidly dissipate away from the peninsula passes.

Response 6-118

The Rand model corrects for sea breezes (Liu and Leendertse, 1983a).

Response 6-119

See Responses 6-115 and 6-116.

The simulation of individual trajectories does not use averaged wind and weather data. Individual wind and weather data are pulled out of the complete data base with a two-dimensional stochastic weather model. Individual wind and weather patterns, plus other factors (see Fig. IV-1), drive the trajectories. The results of

individual trajectories are summed, not averaged. If 6 of 60 trajectories from individual, hypothetical launch points reached a target area, the chance of contacting that target from that point would be 6 chances out of 60, or 10 percent.

Response 6-120

The purpose of the OSRA is to calculate the trajectories of oil slicks and the probabilities of land and resource-area contact with a discrete slick. Those aspects of oil chemistry, fate, and behavior necessary for this analysis are included in the model. For example, oil density is a model parameter (Liu and Leendertse, 1981c). Weathering routines have been added to the model (see Fig. IV-1). However, the role of weathering in the fate of an oil slick is almost entirely a function of the chemistry of the spilled oil. Because weathering and toxicity are highly dependent on the specific chemistry of the spilled oil (see Response 4-75); because the EIS is concerned with spills of possibly orders-of-magnitude difference in size; and because slicks usually disappear within 10, much less 30, days regardless of oil characteristics (see Response 4-74); the information gain would be negligible relative to the accompanying increase in complexity of interpretation. With the level of precision possible in projecting effects of oil and gas production from unknown locations within the proposal area over the next few decades, such increased complexity is not desirable.

Instead, fate and behavior of the oil has been analyzed independently of slick trajectories in Section IV.A.3.d. (Fate and Behavior) and in Section IV.F.1. (Water Quality). The effects analyses use information in these two sections, the OSRA, and additional sources in arriving at estimates of oil-spill effects on biological resources.

Response 6-121

This concern is addressed in Responses 4-74 and 6-111.

Response 6-122

The procedure cited does not underestimate risk, but, on the contrary, is mathematically valid and accurate. If a target can be contacted only 3 out of every 12 months, the risk of contact (being aware that a spill could occur during any month of the year over any year within the life of the field) cannot be greater than 25 percent. The 25 percent is the maximum contact probability, integrated over a year or for all multiples of years, regardless of how likely contact is over the vulnerable quarter of a year.

Response 6-123

Additional information on subsea blowouts has been added to Section IV.A.3.d. Note, however, that major exploratory spills--those from drillships, jackup rigs, and semisubmersibles--are more than tenfold less likely to occur than production-platform spills (USDOI, MMS, 1984a). Production-platform blowouts usually, although not always, occur above the water line.

Response 6-124

The derivation of a 200-km² area for a 100,000-barrel spill is given in Section IV.A.3.e. A 100,000-barrel crude spill in subarctic waters would physically cover up to 200 km². The actual area covered by the slick would be about tenfold greater, with 90 percent of the slick surface being open water rather than oil. The commentor overlooks two major points. First, arctic and subarctic crude spills are orders of magnitude thicker than spills of the same crude in more temperate waters. Therefore, they also must be orders of magnitude smaller in area to make up for the additional thickness. Second, the commentor is confusing the area swept by a slick as it moves across the ocean or along a shoreline with the maximum area actually physically covered by that slick at any time.

Response 6-125

The 25-percent evaporative loss over the first 24 hours refers to a typical crude oil; the 11-percent loss refers specifically to Prudhoe Bay crude, which has a higher asphalt content and lower evaporative rate than the typical crude (see also Response 4-75). That spilled oil would have the characteristics of Prudhoe Bay crude is a conservative assumption for this EIS.

Section IV.A.3.c. of the EIS states that 3 days represented diminished toxicity of the spill. None of the papers cited by the commentor argue that toxicity increases rather than diminishes with time. Table II-2 does not assume that only the first 3 days of a spill can affect resources. On the contrary, the time scale used depends upon the effect being addressed. If effects are due to toxicity, then 3 days probably is appropriate, except perhaps very close to shore or in an area with very restricted circulation. Such situations do not occur in the proposed lease sale area, the point of origin for trajectories. If effects are due to physical contact with the oil slick, longer timeframes are appropriate and are used (see also Response 4-73).

The statements in Section IV.B.1.a.(1) in the EIS as to a week or 10- to 12-day persistence for aromatics from the slick were based on assumptions made during an early St. George Basin synthesis meeting in April 1981--assumptions now recognized as overly conservative by the original authors.

The St. George Basin synthesis meeting occurred prior to completion of OCSEAP studies and in situ measurements of subarctic weathering by Payne (1981, 1982, 1984). Payne demonstrated that for individual compounds, a significant decrease in slick concentrations takes hours to tens of days. Because of this difference in loss rates and because the bulk of these low-molecular-weight compounds are lost within 3 days, a January 1982 NOAA OCSEAP/Alaska OCS Office/ BLM workshop on oil-spill weathering and modeling in Alaskan waters considered 3 days to be the appropriate time period to use as the period for initial higher toxicity of a spill.

The highest rates of dissolution of aromatics from a slick and, consequently, accumulation in underlying water occur in the first few hours after a spill (Payne, 1981). At sea, water depth and shoreline do not restrict movement of slick or water, and the slick and underlying water generally move in different directions. Thus, at sea, the water under the slick changes continuously and aromatics do not continue to accumulate in the same water.

Duration of aromatic concentrations in the water column is a separate question from duration in the slick. As stated above, concentrations of aromatics decrease continuously within a slick, with most aromatics being lost within 3 days. Concentrations within the water column depend upon the depth and rate of vertical mixing, the size of the spill, rates of horizontal mixing, and advection. The differing directions and rates of movement of slick and water limit the contact time and, therefore, concentrations of dissolved hydrocarbons in the water of the open sea.

Cline (1981) studied dispersion of dissolved hydrocarbons in Bristol Bay and developed a dispersion model based on the observed decreases in dissolved hydrocarbon concentrations with distance from the source. Based on this model and the observations of dissolved hydrocarbon concentrations made in Bristol Bay, concentrations of dissolved hydrocarbons would be reduced tenfold within 12 kilometers from the input source, hundredfold within 80 kilometers, and thousandfold within 520 kilometers. These estimates ignore any losses of dissolved hydrocarbons to the atmosphere, which would further decrease dissolved-hydrocarbon concentrations (Cline, 1981).

Note that, in the above analysis, the decrease in water-column concentrations is by dispersion; i.e., by mixing and dilution, not by removal of the hydrocarbons from the water. The commentor should be aware that there is a difference between dilution and the physical removal of hydrocarbons from the ecosystem; i.e., the reference to Vandermeulen (1982). Once diluted, degradation of dissolved hydrocarbons will be slow, partly because microbial decomposition is slower at lower substrate concentrations. However, toxicity is better related to a high concentration of hydrocarbons than to persistence of very low concentrations.

Response 6-126

Although toxicity can be increased by photo-oxidation, there are two very important considerations that minimize the effect of this increased toxicity. Photo-oxidation is a surface phenomenon; the ultraviolet does not reach very deeply into the ocean or into a surface slick, particularly the thicker slicks to be expected in the subarctic and arctic (see Response 6-124). Also, photo-oxidation is a relatively very slow process; the production rate of photo-oxidized toxics is slow; and no appreciable accumulation of such toxics would be expected in the open sea (see also Response 6-125). Also note that studies by Payne (1981, 1984) referenced in this EIS were conducted out of doors under in situ subarctic conditions.

7

NUNAM KITLUTSISTI

Protectors of the Land, Inc.
P.O. Box 2068 • Bethel, Alaska 99559
907/543-2856

RECEIVED
MAR 15 1985
REGIONAL DIRECTOR, OCS
ANCHORAGE, ALASKA

March 13, 1985

Mr. Al Powers
Manager, Alaska OCS
Minerals Management Service
P.O. Box 10-1159
Anchorage, Alaska 99510

Dear Mr. Powers:

Attached are the comments of Nunam Kitlutsisti on the Draft EIS for Lease Sale #92, North Aleutian. I regret that our comments are not more complete, but time was of the essence in getting our comments to you.

7-1a The most important and glaring omission with the document is the fact that the DEIS analyzes subsistence impacts only for the lower Alaska Peninsula communities. Salmon, herring, marine mammals and birds migrate through this lease area to regions all around western Alaska. For our area salmon, herring, waterfowl and marine mammals - all of which migrate through, feed, or rest in or near the lease sale - are extremely important to our subsistence way of life. Despite this, the DEIS does not address the impact to our communities which this action could have. We believe that such an analysis is required under Title 810 of P.L. 96-4887, ANILCA. We strongly urge that this analysis be done in the final draft.

In closing, I wish to state that Nunam Kitlutsisti supports the comments of United Fishermen of Alaska on this DEIS and urge you to delay this lease sale.

Thank you for this opportunity to comment.

in peace,

harold sparck

harold sparck

COMMENTS OF NUNAM KITLUTSISTI ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR LEASE SALE #92, NORTH ALEUTIAN SHELF

III.B. Biological Resources

1. Fisheries Resources

7-1b Although all five species of Pacific salmon are located in the North Aleutian Shelf, no mention is made in the DEIS of the migration routes of these salmon entering the lease areas, and northern movements of these species out of the leasing area.

7-2 The MMS has arbitrarily drawn lines in the ocean, and asked all observers to focus on a specific site in the ocean. MMS rejects any suggestions that cumulative impacts throyughout the migratory range of the salmon may lead to comprehensive changes in migration pattern and/or increased ocean mortality.

By limiting its DEIS investigation to the area of projected #92 leases, MMS intentionally limits impacts to a small ocean space, and redcuces risks to existing uses and their users. This issue is critical in any public policy discussions focusing on net national worth resulting from the planned activity. By limiting potential harm done to users out of the region, MMS can then postulate worthwhile net profits resulting from national dedication of this biologically rich ocean area to oil and gas development.

Tag studies completed in 1959-60-61 by the Bureau of Outdoor Fisheries, and more recently in 1984 under contract by the Alaska Department of Fish and Game demonstrate that a majority of the chum (dog) salmon moving from the North Pacific/northern Gulf of Alaska through False Pass and Unimak Pass are from streams in northern Bristol Bay and the Arctic Yukon-Kuskokwim Delta, areas north of Bristol Bay, This vast region supports over 2200 commercial salmon fishermen, and over 4,000 subsistence harvest families.

7-3 MMS and oil companies maintain that little harm will come to fish from daily oil operations, or worst case scenarios of multi-day blow-outs. MMS incorrectly characterizes all salmon fiseries potentailly impacted to be of the dominant sockeye salmon population.

7-4 We question the continuing wisdom of MMS to state that a loss of few salmon will do little harm. Fisheries resources in northern Bristol Bay and the A-Y-K have been significantly reduced in recent years due to conservation reasons and increasing subsistence demand. Loss of fall chums in the Unimak and False Pass areas will be an additional financial hardship.

Under Title III of the OCSLA Amendments of 1978, the Offshore Oil Spill Fund, only individuals with existing market values and proof of harm directly linked to offshore oil spills can cliam damages. Indirect take by altering migration patterns, or reducing critical seasonal habitat thereby increasing ocean mortality is not currently construed to be subject to claims under this Fund.

There are many unknowns in the Arctic. In fact, the recently enacted Arctic Research and Policy Act of 1984 established Congressional policy that more in unknown then is known about America s Arctic. These unknowns lead to the extensive listing of stipulations and mitigating measures to protect Arctic values for future generations in all current development projects.

Since the inception of "Project Independence" by the Nixon Administration to search the seafloor within America s jurisdiction for oil and gas, our villages, this Congress, and the public have been told that the canopy of National environmental laws, Arctic Operating orders, regulations, Information to Lessee, and the ultimate club, the Secretary's ability to halt all OCS development activity when public values are threatened, will protect everyone's interest.

This does not work in the Arctic for there is no effective monitoring or enforcement program.

Western Alaskan fishermen pay very close attention to what happens at sea. The State knows that Federal resource agencies: Environmmental Prctection Agency: Federal Fish and Wildlife Service: National Marine Fisheries Service: have no funds, and have never visited an Arctic OCS platform to monitor compliance.

MMS writes a type of Stipulation #4 in all leases to hold all parties on paper to strict standards to conserve wildife while conducting OCS exploration. This stipulation also requires on-site biological monitoring. One of the standard provisions if required by MMS is that developers must "operate during these periods of time that do not adversely affect the biological resources as established by MMS, or modify operations to ensure that significant biological populations or habitats deserving protection are not adversely affected."

7-5 The State recently questioned how ARCO was going to comply with Stipulation #4 in its Navarin Basin, Sale #83 leases. ARCO responded as follows:

> "There is apparent confusion over the intent and purpose of Stipulation #4, and our responsibilities under the stipulation."

ARCO states that all MMS requires ARCO to do is side-scan sonar and subbottom profiler data reports to determine if structural problems for anchors and rig stationing are present, or if unique seafloor communities exist on drillsite. MMS s only concern is that Santa Barbara type uncontrolled blow-out does not occur in the Bering Sea. MMS does not require biological monitoring even for endangered bowhead whales.

(Cite ARCO answer to State question #4 on ARCO-EP)
The MMS never asks, and as ARCO states, industry never voluntarily offers biological monitoring before or during operations. Given the magnitude of the unknowns, and the future values at risk, how is anyone going to know if no one looks. In specific regard to Sale #92, American fishermen operating through joint venturea have caught thousands of metric tons of chum salmon. From previous tagging cited above, these are thought to be A-Y-K "fall" chums. How will anyone ever know if no biological surveys are ever undertaken.

Failure to identify potential losers in an economic exchange is grounds for re-writing an EIS.

Further examples of MMS and Industrial harm of National resource values abound.

7-6 In 1981 distant government routinely granted a seismic permit, and listsed stipulations to conserve the environment. The seismic operator to cut coats, uses dynamite inside the Yukon River, and up and down the coastline. Witnesses reported to the MMS that fish were found floating, their air bladdera exploded; bearded seals and belukha whales actively being hunted by village subsistence hunters disappeared; and seabird colonies vacated their rookeries on Stuart Island to escape the noise of the explosions. Although the villages went without food, no change in MMS operations on seismic was undertaken. Some equal trade. (see "The Issue is Survival," Page 16)

In 1980-82, in preparation for Norton Scund Sale #57, over 10,000 nautical miles of seismic surveys were conducted off-shore. Government issued permita, with no monitoring program. Beginning in fall,1980, bearded seals, the mainstay of Yukon Delta village marine mammal diet, disappeared from the Delta. These villages have situated themselves in opportunistic locations to harvest migratory wildife. In the knowledge of the elders, this has never happened before. Seal hunters in recent meetings have reported that through winter, 1984, they had to travel over 60 miles of offshore ice away from the area of seismic exploration to locate these seals. MMS and the Industry state that there are no carcasses, therefore they are not responsible. Cash-poor little people in tha villages suffer. The lesson has still not been learned, for MMS does not require bioloigical monitoring of seismic operators to determine impact.

7-7 Third, threatened Pacific Black Brant use the vast eel grass beds of Izembek Lagoon as critical staging areas. Most important is the fall migration. These geese feed up to six weeks to develop body fat to support their 50+ hour straight ocean flight to Baja Peninsula. Helicopters servicing platforms in the St. George Basin stationed in Cold Bay adjacent to Izemebek Lagoon made repeated overflights. I have presented to the Committee newspaper articles on this issue. Once warned that their flight operations were harassing this threatened goose species that Alaskans and Californians have worked so hard to conserve, the

MMS and Oil Industry did nothing. Oil industry helicopters continued to harass the Brant. Interior ordered FWS not to invoke its authority to cite violators harassing wildlife in refuge airspace. OCS is Interior's marching order.

B.2. Marine and Coastal Birds

(Cite ARCO response to State Q#4 on monitoring)

Northside of Alaska Penninsula is of vital importance to the peoples of Western Alaska. In recent years, four species of Arctic nesting goose:The Pacific Black Brant: the cackling Canadian Goose: the Emperor Goose: and the Pacific White Front Goose; have all suffered precipitous declines in their population.

A combination of permanent habitat loss in wintering areas: seasonal habitat loss in prime nesting areas: human take at both ends of the flyway: unseasonal weather changes: pesticides and other forms of toxins comtanimating wintering areas:and predation by birds and small fur bearers: have all contributed to the current declines. States of the Pacific Flyway Council, environmental groups and interested Alaskan Native and sports hunting groups have worked for five years to fashion a comprehensive agreement into limits of human and predator take, conservation of habitat, and expanded biological and habitat research programs. These agreements are part of the comprehensive Yukon-Kuskokwim Delta Goose Management Plan.

V-147

One habitat zone of critical importance is Izembek lagoon. In the spring and fall, all four species of threanted Arctic nesting geese stage to some degree. Of the two staging periods, the fall migration is most critical. Izembek Lagoon supports theworld's largest eelgrass bed.

7-8 The entire Pacific Flyway population of threatened Black Brant converge in the Lagoon beginning in late September with yearlings and sub-adults. Once there, the Brant feed on the eelgrass at the change of tides. Brant feed for approximately 6 weeks, storing body fat necessary for nourishment for their 50+ hour oceanic flight to Mexico's Baja Penninsula. Interruptions of feeding could increase ocean mortality.

7-9 In fall, 1983, the oil and gas industry began preparation for helicopter support facilities in Cold Bay, a community located adjacent to Izembek lagoon. Cold Bay was selected as a site for the helicopter support base for IFR instrumentation was installed, whereas the main shipping port, Dutch Harbor did not have IFR. The State of Alaska supported the Federal Fish and Wildlife s proposed flight restrictions on helicopters, drawing flight plans on VFR and IFR at certain heights around Izembek Lagoon as its only stipulations under its determination of exploration plan consistency. However, Subcontractors for major offshore drillers worked out IFR flight plans with the FAA that went directly over the feeding grounds of Izembek Lagoon. When

questioned by FWS, Alaskan Natives, the State of California, and the press, Drillers citing safety as reason for Izembek overflights, but promised to correct the problem. In following weeks, FWS continued to complain about overflights harassing Black Brant, and newspapers published accounts of the continuing conflict. Neither the MMS, nor industry made any substantial effort to halt the harassment of Black Brant. Helicopters continued to overfly Izembek and the Industry questioned publicly why there was any problem. To date, FAA with Industry encouragement has refused to refile IFR flight routes for Izembek Lagoon. The FGWS has been ordered by policy makers in Interior not to invoke its statutory authority to cite violators harassing wildlife in refuges with aircraft, and Industry has made no plans to relocate helicopter activities to Dutch Harbor during the period of intense waterfowl utilization of Izembek.

Industrial spokesman had participated in numerous meeting with Western Alaskan villages where migratory waterfowl populations, and habitat were discussed. Industry was well aware from meetings and from extensive newspaper coverage that a problem existed with Arctic Nesting Geese. On Septerber 14, the Refuge manager for Izembek lagoon sent a letter to the MMS questioning the wisdom. Neither MMS or Industry wish to recognize industrial interference with critical waterfowl habitat or threatened migratory waterfowl species as significant issues to be addressed by the DEIS.

B.3.4.5.

Respond to "The Issue is Survival" issues on seismic testing and reaction of marine mammals: through in Borough talk about bowheads.

Second issue is that most forms of marine mammals require prey species that are benthic. Allocation of benthos between competing users is subject that I did not see addressed under B.1.

C. Social and Economic Systems

7-10 MMS arbitrarily drawing lines in risk assessment. Key to this entire section is to enlarge affected comunities under assumption of risk element. MMS argues that only communities located adjacent to activity could possibly been affected. I havenumerous reports showing how fishing income and subsistence non-income take is the glue that holds modern rural communities together. I am enclosing for your review copy of BIA funded study that David Friday and I did showing conversion from subsistence to imported food economy:

Lower Kalskag	$5,949.112
Marshall	$10,427,920
Atmaulthuak	$10,095,851
Newtok	$6,376,811

Frank Orthe report on economy of lower Yukon villages is in

printing stages, but is enclosed to show you income flow within these villages.
Appendix A-1:page 91:shows dependence on commercial salmon harvest

Page 83:Conclusion

PARt IV.B. Alternative I.1 Effects on Biological Resources

Comment to this is issue of risk assessment, and predictive value. With no knowledge of cause and effect in the Arctic, Government as the social arbitrator on dispensing ocean values must err on the side of conservation and caution. Since government has no biological monitoring or enforcement capacity. MMS does not require the developer to have in place a biological monitoring program similar to the very limited self-monitoring required under NPDES permits. For this reason, cannot predict conseuqneces in either spatial, seasonal, or magnitude for the Federal government does not know anything. It is learning about the frontier areas only from what Industry sa propriatory site-specific investigations allow MMS to understand. The risks are too great to allow this learning while doing to be the chosen way to do business in the ocean.

When defining risk, no trajectory is tested. When oil reaches shore, and cite the "Alvenus" spill off of Calcasieu, Lousiana, the 34,000 gallpons of refined oil that spilled off the Sonoma Coast, the ship that fouled San Fransisco Bay when sabatoged, and the findings of the U>S> Coasta Guard's "National Strike Force" in Katchemak Bay that current technology cannot handle Alaska.

You can then talk about recovery time, postulate the years and number of fish for the environment to recover its ability to provide "servicea" to wildlife, and rough out a net cost that would equal when multiplied by years of replacement to net worth to be gained.

2. Effects on Social and Economic Systems

a. Effects on Comm. Fish. Industry

7-11 Critical weakness is the idea that all fish will move out, and can be caught in different location. This does not answer question of critical habitat, for government dioes not know if these areas are critcal habitat, and when coupled with other loss of critical habitat, could accumulatively lead to reduction in fish populations.

b. Effects on Lccal Economy

7-12 Key is arbitrar MMS line that defines zone of impact, and thereby limits risk from exploration. Only Cold bay and Unalaska cited. Disregard from communities dependent upon marine resourced at risk and at remote sites from exploration is unfounded.

MMS historically drawn arbiotrary 1:ines. In Sale #57, MMS drew line through center of Norton Sound stating that all development would take place north of that line. This convention eliminated social values of national significance in the southern hemisphere of Norton Sound, including the internationally critical Yukon Delta from consideration by MMS in its DEIS. During leasing, the majority of OCS lease activities took place in the southern hemisphere of Norton Sound. The State of Alaska had to involve itself through the Coastal Zone Management Consistency Process to make up for the negligence of MMS to address social and biological values at risk by Sale #57 developments.

MMS drew similar lines in the St, George and Navarin Basins to limit social risks, and thereby reduce national costs to elevate net national benefits from holding the sale. In each case, the State, and Courts when appropriate ruled that MMS violated its mandate to protect alternate uses and users of the continental shelf resources. This was the 9th Circuit Court of Appeals finding in Gamble and Stebbins vs. Clark.

The MMS stated that it would fully investigate data gaps in its knowledge of Sale #92 acreage. Yet as displayed by this product, MMS again has failed to address areas asociated with the seasonal wildlife at risk by subsistence or commercial activities.

Refer to Orthe and BIS study on socio-economi impacts

d. Effects on Subsistence-Use Patterns

See "c" above

Subsistence use by northern Bristol Bay villages of Togiak, Manokatak, and Twin Hills, the Yukon-Kuskokwim Delta, and Norton Sound is not included in the text.

7-13 Speciewa of wildlife transiting the lease area of Sale #92 include chum salmon, and Arctic nesting Geese. In years of maximum ice penetration into the Lease area, all forms of marine mammals utilized by these villages are present in Bristol Bay.

The most significant exchange of nutrient rich bottom waters from the North Pacific move into the Bering Sea through the Unimak Pass sill, and then join the Alaska Marine Water's current leading to the Bering Straits. The area of the lease is a nutrient factory for primary production that serves as building blocks for the remaining benthos and nektonic systems in the Bering Sea. Contamination of these biologically rich waters would impact not only local subsistence users of these resources, but those villages associated with future routes of these migratory wildlife forms.

(see Page 1, line 1 for chums)

(see Page 4, line 29 for birds)

7-14 In its survey, MMS only addresses changes in subsistence resource uses in "terms of risks from population increases and oil-pollution events." MMs still continued to use OSRA trajectory mdoels, and has failed to update trajectories developed from Marex remote buoys that the Oil Industry bombarded Alaskans with as state of art frontier area meteorology and oceanography. In response to the State's questions on consistency for Sale #57, the MMS and Oil Industry informed the State of Alaska that September, 1984 was the expected date that MAREX data would be used. This has never been done.

7-15 MMS fails to address changes in subsistence use brought on by:

a. industrialization of critical shoreside areas

b. industrialization of critical ocean space

c. increased competition in harvest of reduced wildlife populations

d .loss of critical habitat from Lease #92, and #92 in combination with other frontier exploration of the Bering Sea that would pose cumulative impact:

e. natural population swings in wildlife accentuated by exploration activities,

f. Alteration of migration patterns that lead to increased ocean mortality(making species available to different rates of predation) as a form of indirect take

7-16 What can be done. The failure of these documents conclusions resides in MMS maintaining that the OCS is not"in Alaska", and therefore not subject to Section 810, Subsistence Protection Oversight which requires the Secretary to consider alternatives and to conserve subsistence values in the ocean.

1. The Secretary in order to compy with the 9th Circuit decision must publish a Section 810 decision in Sale #92 as part of the DEIS.

7-17 2. The Secretary must expand the number of user communities of subsistence resources to include those with a cutomary and traditional history of subsistence harvest on the migratory resources of the Lease Area, including those village of northern Bristol Bay, the Yukon-Kuskokwim Delta, Norton Sound, the Seward Penninsula, Kotzebue Sound, and the North Slope of Alaska.

7-18 3. MMS should calculate the values at risk of subsistence resource for 5 years(semi-protected bays), 10 years(sheltered tidal flats), and 100 year (tidal meadows) recovery, peridos of time for recovery for the different coastal landforms that would be impacted by a spill coming ashore.

7-19 4. MMS should explain how an environmental monitoring program will be funded and staffed by MMS or by industry to comply with the various environmental laws, lease stipulations, ITL's and NT's.

Response 7-1a

The EIS considers subsistence-use effects not only on lower Alaska Peninsula communities but also on the Bristol Bay region (Sec. IV.B.1.b.(4)). The subsistence-use analysis considers the migratory habits of fish and marine mammals that occur in the Bristol Bay region.

Response 7-1b

Information on the migration routes of the five species of Pacific salmon in relation to the North Aleutian Basin is summarized in Section III.B.1. of the EIS. Maps depicting migration and distribution of all five species of Pacific salmon also are included in this section. These maps depict the available information on the areas potentially affected by Sale 92 and areas farther north in the planning area.

Response 7-2

The MMS does not limit the assessment of effects based on arbitrarily drawn lines. The MMS does not imply that these biotic resources (particularly salmon) are restricted temporarily or spatially in their distribution. The focus of these assessments is on the regional population or populations that could be affected by the proposed lease sale.

Furthur, the analysis of cumulative effects on biotic resources in the EIS assumes that other Alaska OCS lease sales on the current 5-year schedule, and state lease sales and commercial fishing in the region, will be developed. This assumption greatly enlarges the ocean-space area where potential effects could occur; however, the focus of the analysis of cumulative effects is still on the regional population(s) of concern.

Response 7-3

Section IV.B.1.a. of the DEIS and Section IV.B.1.a.(1) of the FEIS clearly states, "The various lifestages of all five species of Pacific salmon [emphasis added] may be affected . . . ." While sockeye salmon comprise the major species (in number) that is indigenous to the North Aleutian Basin, the potential for effect on other salmon of the area also is discussed throughout this section.

Response 7-4

Estimates of the potential loss of salmon as a result of implementation of this proposal are in terms of "thousands" of fish; in comparison, the escapement and harvest are in the "millions." Therefore, the possible loss of salmon from offshore oil and gas operations would not show in escapements, commercial catch, or subsistence harvest. The implication by the commentor that increasing subsistence-use demands have significantly reduced fisheries resources in Bristol Bay and the Yukon/Kuskokwim region suggests that subsistence use should be reduced until resources return to historic levels.

Response 7-5

Proposed Stipulation No. 4 is similar to stipulations imposed in other Alaska OCS lease sale areas. The stipulation provides for conduct of biological surveys if the Regional Supervisor, Field Operations (RSFO), has reason to believe that biological populations or habitats exist which may require additional protection. In many cases, the presence of a biological resource or habitat is already known and is taken into consideration in the regulatory and environmental review of a proposed activity. In such cases, the need for an on-site biological survey is unnecessary. Through the Exploration Plan (EP) and Development and Production Plan (DPP) review process, federal and state agencies and the public provide comments and recommendations to the MMS regarding proposed activities, including concerns regarding biological resources. Also, the Bering Sea Biological Task Force (BTF) will be asked to make recommendations to the RSFO in the enforcement of Stipulation No. 4. The RSFO utilizes all available sources--including recommendations and information from the BTF, and from state and federal agencies, MMS studies, analyses and staff recommendations--to determine the need for and scope of biological surveys on a case-by-case basis. Proposed Stipulation No. 4 does not require continual monitoring for biological resources. If a biological resource were discovered during the conduct of normal drilling inspections, the provision of the stipulation would require notification of the RSFO, who would determine the nature of actions to protect the resources after taking into consideration available information and recommendations from the BTF.

The MMS considers the recommendations from the BTF especially important because they provide for an independent analysis from a group of individuals who are extremely knowledgable with a broad scientific background, and an opportunity for input from state and local participants.

The need for and scope of whale-monitoring programs for protection of endangered gray whales would be established in consultation with the National Marine Fisheries Service (NMFS). This will be similar to what was done for the St. George Basin Sale 70 area where a gray whale-observation program was established, and the Navarin Basin (Sale 83) area where a right whale-observation program was established, and a bowhead whale-monitoring program has been tied into an ice-monitoring program in accordance with Sale 83, Stipulation No. 5. Bowhead whales are not expected to be found in the Sale 92 area, and a monitoring program is not likely to be required. However, the MMS has had a bowhead whale-monitoring program in place in the Beaufort Sea since 1978. The need for any monitoring takes into consideration the limited duration, limited scope, and widely spaced aspects of exploratory operations in addition to other pertinent factors. The need for any monitoring will be reevaluated should development or production activities be proposed.

Exploratory drilling and down-hole activities are shut down during the bowhead whale migration period in the Beaufort Sea; thus, no bowhead whale interaction studies could be conducted to date. Union Oil has recently submitted a draft proposal to the MMS, the NMFS, and other interested parties for conducting a scientific-research program for potential implementation concurrent with its 1985 drilling program in Camden Bay. The proposal currently is being evaluated, and input will be obtained from all affected parties before making a determination regarding whether to approve or disapprove the proposal.

Response 7-6

The MMS does not have the authority to and has not permitted seismic activity on the Yukon River. The MMS does regulate seismic/geophysical operations on the outer continental shelf (OCS), which lies beyond state waters (beyond 3 miles from shore). Seismic operations in state coastal and inland waters (Yukon Delta) are subject to state, not federal, control. Nonexplosive devices are almost exclusively used in OCS operations. These devices, including airguns and sparkers, have shown no harmful effects on fish beyond a short distance from the detonation. Effects of both explosive and nonexplosive seismic devices have been discussed in the EIS. Effects on marine mammals and birds from noise disturbance from a variety of sources also has been discussed in the EIS for this lease sale. Abandonment of habitat by marine mammals and subsequent disruption of subsistence harvests have been identified in the EIS as potential effects from noise disturbance.

Response 7-7

After some confusion brought about by the misunderstanding of the MMS's recommendations regarding avoidance of bird and mammal concentrations, the problem of helicopter overflights of Izembek Lagoon was resolved, in part, by agreement between refuge personnel and the flight-service subcontractor. The MMS also met with the Fish and Wildlife Service (FWS), the Federal Aviation Administration (FAA), and the Alaska Department of Fish and Game concerning this specific situation to clarify the issue and examine possible alternatives to avoid or mitigate this problem in the future. Although the MMS regulatory function primarily concerns operations taking place within lease sale area boundaries and on the OCS, it is the aim of this agency to assure that lessees and their contractors and subcontractors are advised of all mandated and recommended operational procedures contained in OCS Orders, lease stip-

ulations, and Information to Lessees (ITL's). This is accomplished most directly through a listing of stipulations, ITL's, and other specific recommendations in the letter from MMS approving the lessee's exploration plan. In this instance, the lessee was referred to information available from FWS containing a map showing recommended VFR flight corridors and altitudes. The MMS also recommended that the lessee contact FAA Air Traffic Manager and Izembek National Wildlife Refuge personnel at Cold Bay concerning clarification of air corridors and procedures to minimize disturbance of wildlife.

Response 7-8

This concern is addressed in Responses 1-16 and 7-7.

Response 7-9

This concern is addressed in Responses 1-16 and 7-7.

Response 7-10

The proposition that ". . .fishing income and subsistence nonincome take is the glue that holds modern rural communities together." in western Alaska is acknowledged as generally accurate. That proposition does not mean, as the commentor seems to imply, that proposed Lease Sale 92 will affect subsistence use in remote areas or villages. The theme of the proposition, plus the relationships between these two types of activities, guided the analysis in Section IV.B.2.d. of the DEIS and Section IV.B.1.b.(4) of the FEIS (Effects on Subsistence-Use Patterns), which encompasses all of the Bristol Bay region and contiguous portions of the Aleutian Islands region, including the northern and southern sides of the Alaska Peninsula. The MMS prepared an analysis in the DEIS of subsistence-use effects under Section 810 of the Alaska National Interest Lands Conservation Act (ANILCA) and held several public hearings, at which testimony and comments on that finding could be submitted. The MMS prepared a revised determination, which appears in Section IV.K. of the FEIS. That determination concludes that no significant effects are likely to occur as a result of Sale 92, even at the development/production stage.

Response 7-11

Under typical environmental conditions, offshore movements of fish may vary because of changes in water temperature, current, and bottom contour (bars, flats). Fishermen alter their location and operation methods to these changed conditions. This also would seem to be the case should migration patterns be affected by offshore oil and gas operations. The MMS believes that any alteration of fish migration routes through this lease sale and adjacent areas due to oil spills or other aberrations would be minor in distance/direction and temporary in duration (hours).

Response 7-12

The section on effects on the local economy deals primarily with employment in communities that would host facilities supporting industry activities. Section IV.B.1.b.(4) of the FEIS (Subsistence-Use Patterns) deals with the effect the proposal would have on communities that are dependent on marine resources.

Response 7-13

The EIS includes the northern Bristol Bay villages of Togiak, Manokotak, and Twin Hills as part of the Bristol Bay region. The villages of the Yukon/Kuskokwim Delta and Norton Sound are not included because there is no evidence to link general biological effects on populations of given species to effects on specific village subsistence-resource-user systems located at considerable distances from the site of the potential affecting agent. The North Aleutian Basin lease sale area is situated approximately 190 miles from Cape Newenham, 280 miles from Nunivak Island, and 320 miles from Cape Vancouver on Nelson Island.

Response 7-14

This concern is addressed in Response 6-116.

Response 7-15

The factors specified by the commentor (industrialization, critical habitat, harvest) were taken into account in considering potential effects on subsistence-use patterns. Those effects are addressed in Section IV.B.1.b.(4) and Section IV.K. of the FEIS. For example, the analysis for Unalaska suggests that "Increased competition for locally available subsistence resources, in conjunction with a potential reduction of habitat resulting from the construction of added community infrastructure, could cause the need for increased local harvest regulation and a resultant need for increased investment and cash outlay in transportation to gain access to subsistence resources, if available, at a farther distance." In the Bristol Bay region, it was pointed out that "direct effects on subsistence-use patterns on specific communities could be realized if an oil spill were to contact coastal habitats or harm or redistribute marine resources within community subsistence-harvest domains." These few brief examples are given to show that the types of factors suggested by the commentor are presently contained in the subsistence analysis.

8

Alaska Oil and Gas Association

AOGA

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(907) 272-1481

March 13, 1985

Mr. Al Powers
Regional Manager
Minerals Management Service
P. O. Box 101159
Anchorage, Alaska 99510

North Aleutian Basin Sale 92
Draft Environmental Impact
Statement (DEIS)

Dear Mr. Powers:

The Alaska Oil and Gas Association (AOGA) is a trade association whose member companies account for the bulk of oil and gas exploration, production, and transportation activities in Alaska. AOGA is pleased to offer for its comments on the DEIS document your review and consideration.

We believe the DEIS represents a thorough and objective discussion of the potential impacts associated with this sale and resultant exploration and development. In our opinion it fully complies with NEPA requirements. We sincerely compliment MMS for a job well done.

We strongly recommend proceeding as scheduled with the proposed action (Alternative I) to offer for lease all blocks included for study in the EIS for the North Aleutian Basin (Sale 92).

The North Aleutian Basin planning area consists of 32.5 million acres, entirely covering the North Aleutian (Bristol Bay) area. However, following the call for information and subsequent consultation between the Secretary and the Governor of Alaska, the proposed study area for OCS Sale 92 was reduced to approximately 5.6 million acres. This area represents only 17 percent of the planning area and lies generally in the southwest portion of the North Aleutian Basin (ref. p. I-A-3 of the DEIS).

Further action toward cancellation of the sale (Alternative II), delay of the sale for 5 years (Alternative III) or deferral of leasing all tracts within 40 kilometers (25 miles) of the coast (Alternative IV) is not justified in view of the limited risk of significant environmental impacts identified in the proposed action. Proceeding with the proposed action is further supported by the significant interest of the oil and gas industry in this area as a potential hydrocarbon producing area.

As a result of the request for comments on development of a new five year oil and gas leasing program that was published in the July 11, 1984, Federal Register, the industry rated this area second in interest of all OCS areas and third in resource potential of the 13 planning areas offshore Alaska. Compared to the industry ranking, the Minerals Management Service has assigned an inconsistently low mean volume resource potential to the sale area. If this mean volume potential were used to rank the Alaska planning areas, the North Aleutian area would rank lowest. However, the actual resources of the sale area can only be established by exploration. Therefore, we believe the Department of Interior should hold OCS Sale 92 as proposed in order to fulfill its charge to allow expeditious and careful development of resources to meet the energy needs of the country.

We would like to emphasize that pipelines are only one of several transportation alternatives which should be evaluated for environmental and economic merit. Each discovery, if there are any at all, is different, with different potential markets. The EIS should not dictate design alternatives at this early phase. Rather, it should let innovation and creativity flourish if and when it comes time to design such systems.

We noted in the DEIS inconsistencies in resource estimates for the various alternatives, which in turn affects development schedules and the numbers of facilities required. We ask that you analyze our detailed comments on the subject and revise these estimates accordingly.

The use of conditional and final probabilities in the oil spill risk analysis, leads to inordinately high projections of oil spill impacts to target areas. We suggest that the oil spill risk analysis be re-evaluated in light of our detailed comments.

AOGA urges urges the Department of Interior to pursue Alternative I for this sale, proceed as scheduled with no additional stipulations and allow a 10-year lease term, appropriate for a frontier offshore area such as the North Aleutian Basin.

We appreciate the opportunity to comment and ask that the detailed critique that follows be given careful consideration. Please feel free to contact AOGA if you wish further clarification on these comments as well as other questions.

Very truly yours,

Wm Hopkins

WILLIAM W. HOPKINS
Executive Director

WWH:tp6:646
Attachment

DETAILED COMMENTS OF THE
ALASKA OIL AND GAS ASSOCIATION (AOGA)
ON NORTH ALEUTIAN BASIN DRAFT ENVIRONMENTAL IMPACT
STATEMENT (DEIS)
March 13, 1985

SUMMARY, Page XVIV - Fourth Paragraph

8-1 The tanker size postulated (80,000 DWT) is significantly smaller than what industry is currently using to transport North Slope crude. This exaggerates the numbers of loadings and traffic levels and possible related environmental impacts. We recommend that the analysis use as a minimum 120,000 DWT tankers.

Table S-1, Footnote 7, Last Sentence

8-2 This sentence should be deleted since the Balboa Bay region assumed for the onshore pipeline and terminal site does not hold wilderness value. According to the Wilderness Act of 1964 and the U. S. Fish and Wildlife Service (USFWS) August 1984 draft Alaska Peninsula National Wildlife Refuge CCP/WR/EIS (Comprehensive Conservation Plan/Wilderness Review/Environmental Impact Statement), several criteria must be met to qualify an area as a potential wilderness. Specific criteria not met are Federal Land Ownership, Apparent Naturalness and Size of the Area. The terminal site would be on private lands surrounding Balboa Bay. The pipeline corridor would cross about five miles of refuge land before reaching private and state inholdings surrounding Herendeen Bay.

Table II-1, Page II-A-1

8-3 The table shows the same recoverable reserves available for Alternative I and Alternative IV. However, Alternative IV offers 137 fewer blocks for lease. This indicates that there is no prospective acreage with resource potential in those 137 blocks. This is misleading in that it reflects no decrease in resource potential by deletion of more than 77,000 acres from the sale. Deletion of these blocks could limit interest in this sale area.

Page II - B - 1, Paragraph B-2

8-4 The EIS should point out that the offshore loading scenario may be applied to any eventual resource development. Offshore loading terminals have proven to be an environmentally sound export system throughout the world and could be the most environmentally and economically effective system throughout the sale area under all cases - maximum as well as minimum case. The economics of offshore loading for all cases is reported favorably in the "Evaluation of Bering Sea Crude Oil Transport System", July 1984, Han Padron Associates, report.

Figure II - C - 2

8-5 The transportation scenario portrayed on this figure shows a circuitous offshore pipeline route through Port Moller and Herendeen Bay rather than a more technically and more economically prudent direct line landfall. Typical offshore pipeline costs are significantly more than onshore pipeline construction, so such routing would be avoided where possible.

Page II - C - 5, 6, Stipulation 5

8-6 The prohibition of offshore loading "following the development of sufficient pipeline capacity" is unwarranted and could preclude the development of marginal fields. Even with major trunk pipelines in place, it may be uneconomic to develop fields that are remote from such trunk pipelines if long tie lines are required. There are several examples in the North Sea of such situations. Offshore loading would be the only feasible alternative.

Furthermore, the analysis in the DEIS has not shown that offshore loading poses significant environmental risk. Stipulations, such as Stipulation 5, should have a sound empirical and analytical basis.

Page II - C - 9, Second Paragraph, Middle, and II - C - 10, First Paragraph, Statements

8-7 "Lessees are advised that operations, including geophysical surveys, may be restricted or suspended, if appropriate, by the Regional Supervisor Field Operations (RSFO), on any lease, whenever endangered whales are present in the area or sufficiently near to be subject to disturbance from offshore oil and gas activities which would be likely to constitute a 'taking' situation".

This statement is inconsistent with statements made later in the DEIS on Page IV-B-61 (second paragraph) that the NMFS (in a Task Force report on gray whales off California) believes that: 1) no evidence was found to suggest that airguns and other nonexplosive acoustic sources cause injury to marine mammals, including gray whales; and 2) geophysical exploration off the California Coast does not constitute "harassment" of migrating gray whales, as defined under the Endangered Species Act.

The MMS agrees, on page II-C-10, that the NMFS determination may also apply to the North Aleutian Basin sale area as gray whales, when present in the St. George Basin, are in a migratory mode. Data presented in papers at the Third Annual Bowhead Biological Conference have also shown that bowhead whales are present in the Canadian Beaufort Sea and have been in close proximity to seismic as well as exploratory activities in an area known to be a summer feeding area for the bowhead. Thus, restrictions and/or suspension of oil and gas activities when endangered whales are in the area are not necessary for the protection of the species.

Page II - C - 10

8-8 The two-paragraph section entitled "Information on Endangered Whales" is repeated. The redundant paragraph should be eliminated.

Page II - C - 10, First Paragraph, Line 2

Delete "intends to" and insert "may". The RSFO has the discretion to limit or suspend noise - producing operations if whales are being disturbed. The words "intends to" may be construed to
8-9 reduce the discretion of the RSFO to determine if operations should be limited or suspended. Because the risk of problems with endangered whales has a low probability (see page II - C - 10, second paragraph), the full discretion to limit or suspend or to not limit or suspend operations should be kept with the RSFO.

Page II - C - 12, Fourth Paragraph , Line 13

Delete "especially where the probability of an oil-spill is comparatively high". This phrase is not necessary because it is the vulnerability of the biological resources not the place of a
8-10 potential oil spill which is key and the use of the words "where...probability...is comparatively high", serves only to provide an erroneous impression to the public about the likelihood of oil spills.

Page II - C - 16, Section 4, Second Paragraph

8-11 See our comment on Table - II-1, Page II-A-1.

Table II-2, Title

8-12 Please delete the word "Major" from the title of this table. This word has a specific definition in the draft EIS (Table S-2) and does not apply to this summary which includes all ranges of effects.

Table II-2, Proposed Alternative, Fishery Resources, First Paragraph, Fourth Sentence

This sentence overstates the potential effects of Sale 92 on the Port Moller fishery. Further, it seems inappropriate to include
8-13 this type of statistical information in the summary where it could easily be taken out of context; we suggest that it be deleted. A sentence, "the probability of a 1,000 bbl or greater spill occurring is once during the entire productive life of oil from the proposed sale area, assuming a commercial discovery of oil is made", should be inserted between the third and fourth sentences.

Also, "The probability of spilled oil coming ashore during the Salmon run seasons cuts down the probability of injury to the Salmon even further" should be inserted between the fourth and fifth sentences.

A final probability of 24 percent for contact with the Resource Area (RA 7) is too high given the conditional probabilities presented in Appendix G. Of the thirteen potential launch sites selected in the Sale 92 area, only two show any probability above nil for contact with RA 7 within three days. Under the assumption that a spill would be equally likely to originate from any of the launch points, the overall probability that a spill in the lease area would contact RA 7 is approximated by the arithmetic average of all thirteen launch site conditional probabilities for such contact. Using the data presented in Table G-1 this average is [95.5 + 35 + (11 x 0.5)]/13 = 10.5 percent. If this is a reasonable approximation for lease-wide conditional probability then it does not make sense to have a final probability which is over twice as large. The high final probability currently shown in the draft EIS is apparently caused by the assumption of a single transportation scenario which places a pipeline from any possible launch site through site D1 (shown on Graphic 5 in the draft EIS). Site D1 is immediately adjacent to RA 7. Thus the spill probability from point D1 is incorrectly portrayed as being higher than at any other launch point due to the assumed single transportation scenario.

The conditional probabilities do not account for the fact that contact with RA 7 would not in most cases lead to significant effects on the regional fishery. Three reasons that effects on fisheries would be reduced are: (1) crude toxicity decreases rapidly following a spill particularly during the first three days and becomes essentially non-toxic after ten days, (2) vulnerable and commercially important species pass through the area on an intermittent and seasonal basis, and (3) clean-up, weathering and natural dispersion reduce the likelihood of contact in the target area.

The final probabilities do not reflect the likelihood that no discoveries and subsequent development would occur in the lease area. The draft EIS predicts that there is only a 21% chance that the mean case reserves will be discovered. This statistical probability error surfaces repeatedly throughout the document, and should be corrected.

Table II-2, Commercial Fishing Industry

The term MAJOR is inappropriate in the last line of this section
8-14 since its definition has long-term connotations and the effects of a major oil spill would be relatively short term.

Table II-2, Local Economy

Effects on the local economy by increased employment opportunities
8-15 may be MINOR at Cold Bay, but should be more signigicant in other regional communities. Joblessness in the Aleut region would likely be reduced during development and production, but would be dependent upon the level of interest in employment by the local population.

Table II-2, Land Use Plans, Last Two Lines

This effect should be changed to MINOR because: (1) the effects will be mitigated by existing and future land use and CZM plans as
8-16 well as federal, state and local regulations, and (2) a large amount of land is available for new developments. Also, as explained under the comment for Table S-1, Footnote 7, Last Sentence, this land does not hold wilderness value.

Table II-2

The analysis in this table overemphasizes the reduction in environmental effects of Alternative IV, since most of the effects
8-17 of Alternative I are MINOR or NEGLIGIBLE. There appear to be inconsistencies between the resource estimates and the oil spill risk related to Alternative IV, since transportation (pipelines and tankering) would account for a significant portion of the risk analysis and would occur in the Alternative IV area anyway.

Figure III-1 (preceeding page III-A-2)

This map showing the sale area and the geologic basins should be modified to show the areas considered for deletion under Alternative IV. Such an overlay will make apparent that prospective areas are being considered for deletion.

SECTION III, General Comment

It would be useful here and elsewhere in the DEIS to define habitat terminology including "critical habitat" and "important use areas". Such definitions should include both standard scientific (biologic) terms and terms with legal connotations. This would aid in identifying the relative sensitivity of particular species and habitats to environmental perturbations.

Page III B - 23, Fifth Paragraph, Line 3

Delete "and may be adversely affected by proposed OCS oil and gas
8-18 industrial activities". Such a conclusion is unnecessary in this description of the environment chapter and is inappropriate in this section because there is no discussion of the assumptions which lead to such conclusion.

Page III - B - 24, Second Paragraph, Lines 2&3

Delete "in terms of potential adverse effects of oil and gas activities in the lease area". The discussion is not put in terms
8-19 of potential adverse effects; it is in terms of a description only - as it should in this Chapter 3. This phrase is unnecessary. It inappropriately implies a conclusion without supporting argument and, therefore, it is misleading to the reader.

8-20 Page III - B - 29, First Paragraph, Lines 6&7

The right whale sighting coordinates are not "in the lease area" (See Graphic 4). Indeed the sighting was over a hundred miles from the lease area. The sentence should be reworded to reflect this fact.

Page III - C - 3

The first paragraph under "b. Salmon Fishery" concludes with the following sentence: "The North Aleutian Basin lease sale could affect both the Bristol Bay and the Alaska Peninsula salmon fisheries."

8-21

This statement is prejudicial and has no place in the description of the affected environment. Further, no information is provided to show how the sale could affect the salmon fisheries. We recommend that the sentence be deleted from Section III. If it is appropriate, the place for the statement is Section IV with supporting data to back up the statement.

Page III - D - 8, Second Complete Paragraph

No new buildings were constructed by ARCO. It would be better to
8-22 substitute this paragraph with the following: "Industry has renovated some existing buildings to develop a shore base at Cold Bay to support exploratory drilling in St. George Basin."

Page IV - A - 1, Section IV.A.1.a. and Tables IV-1 and IV-2

It is noted that MMS has reverted to producing very optimistic development scenarios in the DEIS after significant improvements in recent Alaska OCS EIS's. Assuming a commercial discovery early in the exploratory phase, it would be 10 to 12 years after the lease sale before production would begin in an Alaskan frontier
8-23 area. For example, the Endicott Field in the Beaufort Sea, only 15 miles from Prudhoe Bay, was discovered in 1977 and first production is not anticipated until 1988. After a discovery, several seasons of delineation drilling would ensue. Permitting and preparation of an environmental impact statement would take about two years. Design and construction of a major integrated drilling and production platform would take about 24 to 36 months. It is therefore unlikely that such a platform would be installed

only 5 years after the lease sale. The scenario also shows a hiatus of two years between completion of development wells and start of oil production. Typically, production will commence while development drilling is ongoing and within a year of installation of the platform (depending upon platform design and availability of transshipment facilities).

8-24

Page IV - A - 2 and 3, b. Anticipated Seismic - Survey Activity

In this section the DEIS refers to geophysical surveys which are required for site clearance as "preliminary seismic activities."

This is a poor choice of words to describe post-lease sale site clearance surveys which generally involve very site-specific geophysical surveys. We recommend that such site clearance surveys be described as geohazard surveys. Otherwise, the reader may confuse such surveys with the regional seismic surveys which are generally conducted before the lease sale.

8-25

Page IV - A - 2, A.1.b., Second Paragraph

There is some confusion in the discussion of the number of sites for seismic-survey activity. Lines 6 through 10 refer to the number of exploration and delineation wells and the two anticipated platforms, for a total of 12 expected sites, stating that preliminary seismic activity would occur at 12 sites. The last sentence in the paragraph contradicts this statement. Actually, the last two sentences seem to be more related to the next paragraph and should be deleted. As an additional comment on this paragraph, line 8 indicates all exploratory and delineation wells would be drilled from one rig, but later discussions (page IV-A-4, First Paragraph) indicate the potential use of two rigs in a season. Recommended: either delete "from one rig" or change it to "from mobile rigs".

8-26

Page IV - A - 3, Third Paragraph

This paragraph discusses only one pipeline, for oil. The overall assumption is for two separate platforms, one gas and one oil, requiring one pipeline each. This discussion needs to include both lines. It would be reasonable to assume separate routes through open water, but the lines would need to be routed parallel through Herendeen Bay to landfall. This would reduce the total survey trackline miles somewhat. In calculating the trackline miles, no consideration has been given to the fact that part of the 210 km line is overland. Suggested values: 20 km overland for each line; 40 km shared routing through Herendeen Bay; 150 km open water routing for each line. This would give 340 km to be surveyed, or 211 miles. At 4 miles of survey per mile of line, there would be 844 trackline miles. In the 2nd line, the pipelines would be installed between the production platforms and an onshore terminal.

8-27

Page IV - A - 4, First Paragraph, Line 9

The timing for exploration drilling should agree with the timing discussed previously (through 1990 or 1991).

8-28

Page IV - A - 4, A.1.d., First Paragraph

All previous references to production platforms have involved one for oil production and one for gas production. This paragraph should be consistent.

8-29

Page IV - A - 4, A.1.d, Third Paragraph

In the second line "constructed" should be "completed". The comment in the fourth line should be amended to reflect that terminal capacity and throughput could be larger if there is production from other Bering Sea areas, as discussed for cumulative effects on page IV-A-23.

8-30

Page IV - A - 4

The Han Padron report has indicated that the most economic transport system is to load tankers at offshore terminals and route loaded tankers directly to the West Coast of the Lower 48. This would eliminate the need for a terminal in the Balboa Bay area except perhaps for LNG which is considered to be a nonpolluting material.

Also, as noted in an earlier comment, the tanker class will probably be 120,000 DWT or greater; therefore, the loading increments would be commensurately greater.

8-31

Page IV - A - 5, First Full Paragraph, Line 5

The time span for barge traffic should correspond to the development drilling period as discussed previously, possibly as late as 1995.

8-32

Page IV - A -5, A.1.e., First Paragraph

The length of pipeline mentioned should only be that which will be underwater, or 380 km.

8-33

Page IV - A - 5, A.1.e., Second Paragraph, Line 6

The time frame for exploration/delineation drilling should agree with that discussed earlier (whether it would go through 1991 or 1992). Table IV-3 would also need to be in agreement.

8-34

Page IV - A - 5, A.1.e., Third Paragraph, Line 5

The time frame for cuttings from development drilling should coincide with the timing discussed earlier, possibly through 1995.

8-35 Table IV-3 shows cuttings through 1995. The production well mud discharges shown in Table IV-3 should show values for the same years as there are cuttings discharges.

8-36 Table IV-3

The discharge of produced waters and of sanitary wastes from one platform should coincide with the timing for the last oil production discussed previously (2011 or 2012). Similarly the end of gas production has previously been indicated as 2016 or 2017.

8-37 Page IV - A - 6, First Paragraph, Second Sentence

The wording would indicate that either the whole line would be trenched or none of it would. It is likely that a portion would be trenched, but not all. Recommended: "...would occur only if, and to the extent that, trenching methods were used..." Trenching volumes should be checked and corrected if necessary.

8-38 Page IV - A - 6, First Paragraph, Second Sentence

The paragraph should begin: "During the development drilling and production phases (1990-2016)". The final year may be 2017, as discussed earlier.

8-39 Page IV - A - 8, Second and Third, Paragraphs, Tankers

We have commented in our reviews of previous Alaska OCS DEIS's on the use of worldwide tanker statistics to estimate spill-rates for U.S. OCS activities. There are several serious problems with this approach. First, since Alaskan OCS oil will be carried in U.S. tankers, U.S. tanker spill statistics should be utilized, not worldwide statistics. U.S. tankers have a much better record and operate under generally more stringent regulations. For example, approximately 4 billion barrels of oil have been transported from Valdez without a significant oil spill.

The second problem is that the DEIS should recognize that some of the spill incidents in U.S. waters relate to foreign tankers bringing imported oil into the United States. It would appear that the environmental risks of oil spills are increased if the U.S. becomes more dependent on foreign oil imports.

In fact, the record of U.S. flag vessels carrying crude oil is exemplary. For the most recent period for which data are available, 1975-1983, only 2,988 barrels were spilled by U.S. flag tankers. It would be more appropriate to base a spill projection only on U.S. flag vessel performance.

8-40 Page IV - A - 8, The Alaskan Record

The attempt to include Alaska spill statistics is welcomed; however, it seems inappropriate to include the two airfield spills with offshore platform statistics.

8-41 Page IV - A - 9, Last Paragraph

See comment above regarding IV-A-4.

8-42 Page IV - A - 10, Third Paragraph, Projected Spillage

It is stated that "The Alaska Peninsula Deferral Alternative" (Alternative IV) reduces the probability of oil spills, although it is suggested previously throughout the DEIS that reserve levels are the same for Alternatives I, III and IV. All statistical analyses in the DEIS are based upon a reduced reserve level (243 million BBL of oil) and all statements relating to alternative IV should state such.

8-43 Table IV - 8

If Canadian tankers are to transport crude oil to Pacific Rim countries, the logical route would be paralleling the international data line. It does not seem appropriate to have those statistics playing a role in the North Aleutian Shelf area since the tankers would not transect the sale area at Unimak Pass.

8-44 Page IV - A - 11, Second Paragraph, IV-A-13, Fourth Paragraph

As in our comments on previous Alaska OCS DEIS's, the analysis should recognize the U.S. Coast Guard requirement for a 48-hour spill response, and should include this factor.

8-45 Page IV - A - 14, Second Paragraph, Last Sentence

The proposed wording would indicate there has been no testing of dispersant effectiveness under arctic conditions. This should be revised to acknowledge the work done for ABSORB by Arctec and the research over several years by Don McKay and others in Canada. Then it would be appropriate to say that there are continuing studies on the subject.

8-46 Page IV - A - 16, A.4.a.

Alaska Clean Seas was organized for activities in any waters off the Alaskan coast, both state and OCS, not just for activities in the Bering Sea. In the second sentence, "Cost Participating Areas" should be "Cost Participation Areas".

Page IV - A - 16, Paragraph a., Petroleum Industry Oil-Spill Response Organization

8-47 The phrase "or the adjoining St. George Basin CPA will expand to include the proposed Sale 92 area" should be added to the fourth sentence.

Page IV - A - 17, c., Oil Spill Preparedness by OCS Lessees

8-48 The operational capabilities stated in this section for skimmers is not consistent with MMS requirements (July 29, 1982) contained in "Planning Guidelines For Approval of Oil Spill Contingency Plans."

Page IV - A - 20, A.6.a

The first sentence is confusing in that it refers to the section discussing only actions which will occur in the near future.
8-49 However, roughly half the items discussed are lease sales which have already taken place and leases issued. Some exploration activities have occurred on these leases, although there is no production yet.

Page IV - A - 23

This cumulative case analysis does not take into account the Han
8-50 Padron report which indicates that economics show offshore loading to be the most viable transport mechanism. Offshore loading would eliminate concerns about the onshore Balboa Bay facilities and/or a pipeline across the Alaska Peninsula.

IV - B - 2, Second Paragraph

Data indicates oil slicks do not remain toxic for 10 to 12 days, but more like 10 to 12 hours based on extensive papers of
8-51 McAuliffe et. al. concerning both laboratory and field studies. Furthermore, the vapor pressures of aromatic compounds do not decrease so much in cold water as to support a concept of slow evaporation or dissolution in the Bering Sea.

Page IV - B - 2, Third Paragraph

Existing bioassay results are not well-related to field conditions
8-52 since aromatic toxic fractions probably would not contact organisms continuously for the 96-hour exposure requirement. This fact should be recognized in the EIS.

Page IV - B - 2, Table IV-13

This table should indicate what the percentage of the water
8-53 soluble fraction of crude oil is in order to clarify the concentration indicated with reference to this water soluble fraction.

Page IV - B - 3&4

8-54 Most of the laboratory toxicity studies referred to here are not applicable to a North Aleutian Basin spill because it cannot be shown that toxic components of crude persist for more than a few hours. Even the few field studies cited (i.e. Tsesis spill) do not document the effect on population dynamics of marine organisms, as they only report site-specific toxic effects.

Page IV - B - 4, Second Full Paragraph, Last Two Sentences

These studies report the damage after exposure to crude oil but
8-55 fail to report exposure time of the organism to this crude oil. The implication is that a flash exposure will produce this significant damage.

Page IV - B - 5

The observations on dispersion of toxic components in drilling muds, which demonstrate that actual field effects are unlikely to be lethal, should be extended to the dispersion of toxics from oil
8-56 spills as discussed on the preceding pages of the DEIS.

Sublethal effects of drilling discharges on benthic organisms probably occur only in localized areas around discharges and could not affect an entire population.

Page IV - B - 6, First Full Paragraph

On the basis of the information in the DEIS, dispersion of
8-57 discharged formation waters in the sale area (30-100 meter water depths) would indeed have no harmful impact on marine organisms. This fact should be clearly stated in the EIS.

Page IV - B - 6,7, & 8

The discussion of dispersants is accurate but does not clearly
8-58 state that the on-scene coordinator of a spill clean-up can make decisions that minimize impact to certain species by using dispersants which would only slightly increase impact to other biologic resources. For example, in conditions where birds and marine mammals are at risk and fish are not much at risk, dispersants may be the method of choice.

Page IV - B - 9(b), Effects of Habitat Type - Pelagic and Benthic

This is a good discussion which clearly states that most effects would be localized.

Page IV - B - 10

8-59 A concluding statement as to the positive effects encountered from development of offshore oil and gas activities should be made.

One such positive effect is that oil and gas structures offer "hard bottom" substrata and, as utilized by hard bottom and reef species, become artificial reefs which increase both the biomass and bioproductivity of that given area.

Page IV - B - 12, Nearshore Habitat

8-60 This section fails to quantify damage to nearshore organisms and simply asserts that oil may kill nearshore organisms (i.e. fish). Also, discharges from offshore handling facilities are stringently regulated by the NPDES program. Thus, it is unlikely that routine discharges will contain quantities of harmful hydrocarbon.

Page IV - B - 13, Site specific Effects of Oil Spills. (a) Effects on Salmonids

Good discussion.

Page IV - B - 13, First Paragraph, Last Sentence - Statement

"...the Amoco Cadiz spill near the Brittany Coast resulted in the decimation, and/or contamination of bivalves, echinoderms and amphipods..."

8-61 This statement implies that the spill was the causal factor. Studies have shown that the heavy usage of dispersant directly on intertidal and beach zones accounted for much of the negative effect upon these species at that spill location. The spill itself had short term, less negative impacts, than did the over-zealous use of dispersants.

Page IV - B - 23

8-62 The Han Padron report minimizes or mitigates the risks attached to a Balboa/Port Moller/Herendeen Bay scenario.

Page IV - B - 27, Summary and Conclusion (Effects on Groundfish)

8-63 Moderate localized nearshore effects on larvae and eggs, but a minor regional effect on groundfish is predicted.

Page IV - B - 33 - 35

8-64 A major effect cannot occur in the red king crab population in the Port Moller/Port Heiden area because the odds of over 100 miles of coast being impacted are negligible. An impact from a spill on red king crab would be more local than regional.

Page IV - B - 34, Second Paragraph

8-65 The percentages and damages outlined in this paragraph appear to be overstated if you consider: (1) the time production of oil

would be economically viable, (2) the percentage of the year that the organism would be vulnerable, and (3) that the percentage chance of one spill occurring during that period of vulnerability. These factors should be mentioned in the DEIS discussion.

Page V-B-34, Last paragraph, Second to Last Line

8-67 The phrase "0.1 part per million" should be clarified to indicate what is being discussed. Is it the amount of crude oil, the toxic portion of crude oil or the water-soluble toxic portion of crude oil? The distinction becomes important when considering what effects are likely to occur in a real world case.

Page IV - B - 43 - Fourth Paragraph

8-68 The offshore loading option discussed in the Han Padron report, if used, would mitigate the transport scenario effects depicted in the section.

Page IV - B - 44

8-69 The last sentence in the first paragraph is unclear and should be rewritten.

Page IV - B - 57, Second Paragraph

8-70 It should be noted or explained that this spill occurred in the Persian Gulf as a result of the Iran-Iraq war.

Page IV - B - 60, Fifth Paragraph

8-71 We welcome the inclusion of this discussion on the major vessel traffic off California in the midst of the gray whale migration route. This traffic far exceeds any tanker, support vessel and seismic vessel that would be generated by Bering Sea oil exploration and development. It should also be acknowledged, however, that the gray whale is an endangered species in a legal context only, and not in a biologic context.

Page IV - B - 68, Conclusion (Cumulative Effects on Gray Whales)

8-72 Even if gray whales have been exposed to an oil spill, it does not mean that they will be harmed by it. The DEIS already has documented that the gray whale herd migrated through the 1969 Santa Barbara Spill apparently without harmful effect.

Page IV - B -72

8-73 How can one sighting of a right whale (1966) be extrapolated over a twenty-year period and result in a medium to high probability of oil contacting the whale?

8-74 **Page IV - B - 88, Third Full Paragraph**

The use of offshore loading as discussed in the Han Padron report would minimize oil pipelines, and if gas were not economically viable at that time, would eliminate gas pipelines altogether.

8-75 **Page IV - B - 89, Last Paragraph**

The interference with crab pots that supply boats may encounter, as cited in this paragraph, could be mitigated through communications between crab pot owners and the oil industry. Also, clearly marked crab pots could be readily avoided by supply boats, which are reasonably maneuverable vessels. Also, each platform usually would be serviced once a day by a workboat.

8-76 **Page IV - B - 95, Section 4, First Paragraph**

The statement that "the oil industry is expected to develop support bases for offshore oil vessels" should be clarified, because an existing terminal (the "OSI terminal") is in place for present exploratory operations.

8-77 **Page IV - B - 97, Cumulative Effects, First Paragraph**

While Canadian oil most likely would be transported to Pacific Rim countries, it is unlikely Canadian tanker routes would traverse the sale area or Unimak pass, but it would probably parallel the international date line.

8-78 **Page IV - B - 105, First Full Paragraph**

The DEIS states that in the short term fresh water could be obtained from the city by industry-operated tank trucks. However, fresh water is available from an abandoned military water reservoir on the OSI terminal property.

8-79 **Page IV - B - 113, Second Full Paragraph**

If oil is handled by offshore loading, as discussed in the Han Padron report, the potential impacts as cited either would not occur or be mitigated.

8-80 **Page IV - F - 1, First Paragraph, Line 2**

The phrase "varying degrees of water quality degradation" should be reworded to read "varying degrees of minor and temporary water quality degradation". The resulting degradation from oil and gas exploration and development is nearly always negligible and transient. This is mentioned in the discussion of water quality, but should also be touched on in this first sentence to provide clarification.

8-81 **Page IV - F - 1, Deliberate Discharges from Platforms**

This heading implies an unregulated controlled discharge. It should be retitled to read "Regulated Discharges from Platforms."

8-82 **Page IV - F - 2, Second Paragraph**

A qualitative statement should be included to give comparative meaning to the phrases "impaired water quality" and "impairment". The impairment should be of a minor or negligible nature.

8-83 **Page IV - F - 2, Fourth Paragraph, Line 1**

Table IV - 3 contains values of 3.640 - 327.5MM bbls for total production of formation waters, not the 4.5 to 405MM bbls as stated in this sentence. This inconsistency needs to be clarified or corrected.

8-84 **Page IV - F - 3, Sixth Paragraph, Line 3**

St. George Basin Sale 89 and Norton Sale 100 are stated to have been previous lease sales. These sales have not occurred as of this DEIS. This should be corrected. This statement also needs to be corrected on page IV-F-4.

8-85 **Page IV - F - 4, Seventh Paragraph, Line 7**

What size is the "small area" in which all oil and gas exploration and development is assumed to be conducted? Is it a realistic area?

Additionally, the assumption that the activities occur 5 kilometers offshore for the onshore air quality impacts calculation should not be used because the closest part of the lease sale boundary is about 18 kilometers offshore (see page II-B-1). This three-fold increase in distance from the shore can have a substantial impact on the onshore air quality calculations. The values in Table IV-18 need to be recalculated using an 18 kilometer assumption and the discussion of air quality effects needs to be rewritten accordingly.

8-86 **Page IV - F - 5, First Paragraph, Lines 7&8**

Delete "by use of alternate well locations in combination with slant drilling and". The use of alternative well locations with slant drilling would have only limited usefulness as an onshore emissions reduction tool. Well locations are selected on the basis of geological and reservoir characteristics. Wells must be located to afford maximum geological information and reservoir production. Thus there are limited alternate locations available for wells and they are within close proximity to each other. To deviate very far from the optimum location would reduce the likelihood of making a discovery or of obtaining maximum resource values from a reservoir. Additionally, slant drilling is useful only within a radius of up to about one or two miles, depending upon depth. Thus, a platform location could not be moved very far before the optimum production configuration could be disrupted and the reservoir could not be effectively produced, resulting in lost resource values. Slant drilling cannot and should not be used as an onshore emission reduction technique.

Page IV - F - 5, Fifth Paragraph

The cited authority (Fleury 1983 - for which there is no reference in the bibliography) is not clearly represented in this paragraph. Fleury has stated that the blowout rate has been slowing since 1978 - a date selected because that is when well-control training became mandatory (see Fleury at page 9). The DEIS uses a 1974 date and says the rate is higher. Why was 1974 selected? As can be seen, by selecting different time periods the blowout rate can be called increasing, decreasing or unchanged. It is suggested
8-87 that a sentence be added which provides Fleury's conclusion. For example, in line 5 after the word "drilled", insert: "Fleury concludes that since 1978 the percentage rate of drilling blowouts has been slowing and attributes this to the implementation of well-control equipment and methods". Alternatively the discussion of post 1974 data in the third sentence could be deleted, leaving the basic conclusion, with which Fleury agrees, that there is no statistical trend at this time. There is a trend however, of decreasing duration of blowouts and of decreasing quantities of oil spilled in blowouts, with no large spills (1000 bbls or more) since 1970.

Page IV - F - 7, First Paragraph, Line 4

8-88 Change "5 kilometers" to "18 kilometers" per previous discussion.

Page IV - F - 8, Third Paragraph

The DEIS should point out that, due to existing regulation which
8-89 would include stipulation 1, the oil and gas activities would be conducted in a manner so as to avoid or mitigate any adverse effects to historic shipwreck sites and so the effects would likely be minor.

Page IV - F - 11, Second Paragraph

8-90 The reference to "monocone" platform is too specific and should be changed to "large gravity based" platforms.

Page IV - F - 15, Fourth Paragraph, Lines 4-6

8-91 How would construction and maintenance vehicles "impair the area's naturalness" when they would be confined to roads. Any off-road

construction traffic would have to be specially permitted and would involve specially designed vehicles where required. Also, there are state and federal laws against harassment of wildlife.

Page IV - F - 16, Third & Fourth Paragraphs

The number of docks expected to be used by the oil and gas industry is overstated. For the exploration phase of the Navarin, St. George and North Aleutian Basins, there is a dock on Captain's Bay which has been constructed to serve the oil industry. Little, if
8-92 any, expansion of this facility would be required, because the City dock, the Chevron dock, the Captain's Bay dock, and the Crowley dock are available. If development occurs, Captain's Bay dock could be expanded. Oil and gas activity would likely remain in the Captain's Bay area, away from the Dutch Harbor port facilities used by the fishing industry. Thus, it is unlikely that the OCS activities and other uses would be incompatible. Facility-siting should result in lesser degrees of effects. The cumulative effect of OCS activity with other land uses should be moderate rather than Major as identified in the EIS.

Page IV - F - 21, Last Paragraph

8-93 Based on economics, the Han Padron report proposes scenarios that eliminate or minimize the need for pipelines. This would also mitigate environmental problems that have been indicated. Also, the conclusion is unwarranted and premature.

Page IV - F - 23, Third Paragraph

This conclusion ignores all the regulatory and planning mechanisms
8-94 involved in facility siting decisions. Coastal zone management plans are required to address uses of state concern including energy facility siting. Thus, the facility siting process would not lead to "Moderate Conflicts" with coastal management policies.

Page IV - F - 24, Fourth Paragraph, Fourth Sentence

8-95 The fourth sentence is unclear and unsupported in the DEIS and should be deleted.

Page IV - G - 1, Fisheries Resources

8-96 Mortality of fish from seismic activities is very unlikely, because fish will avoid the boat, and the lethal radius of an airgun is less than about 1 meter.

IV - G - 4, Land-Use Plans

8-97 The cited potential impairment of wilderness values would be mitigated if the Han Padron analysis and conclusions were followed.

<u>Page IV - G - 4, Third Paragraph</u>

8-98 There is extensive discussion about impairment of wilderness values. Although the area may be wilderness in the dictionary sense of the word, it is not a designated part of the National Wilderness Preservation System with its prescribed management policies, including application of wilderness principles. There is a distinction which should be made to avoid confusion over impacts which the activities may have on land status.

<u>Page IV - I - 1, Fourth Paragraph, Lines 4&5</u>

8-99 Delete "ultimately resulting in reduced population levels" and insert "with population level reductions possible". It is not certain that displacement of populations will <u>ultimately</u> lead to reduced population levels.

<u>Page IV - I - 1, Social Systems, Last Sentence</u>

8-100 "The proposal could contribute to irreversible changes in cultural values and orientations." What this statement assumes, perhaps erroneously, is that Native cultures are fundamentally changeless until outside forces crash in upon them; that such cultures are not now undergoing extraordinary changes from all kinds of forces--internal as well as external; and that Native societies only react to things but do not themselves initiate or fully participate in those changes. Too much romanticism persists in talking about Native groups, and it does them a serious injustice.

<u>Page IV - J - 1</u>

8-101 The worst case analysis for the gray whale should have some other means of indicating probability, quantifying perhaps rather than using low, medium, high, etc. In this document major, minor, moderate and negligible have been defined. Perhaps a definition of what is meant by the probability analysis also should be included.

<u>Page IV - J - General</u>

Worst case analysis , or maximum effect analysis, discussions should always be preceded by a statement of the probabilities of this event occurring and the probability of the full range of negative effects potentially occurring. In this way readers of NEPA documents can clearly separate the worst case discussion from discussion of the projects other alternatives.

Federal agencies are required to conduct a worst case analysis if there are scientific uncertainties or gaps in relevant information which are essential to a reasoned choice or important to the decision (See 40 CFR 1502.22). The agencies are not required to

engage in protracted wild speculations containing numerous unessential details.

The key uncertainty for the worst case analysis presented in Section IV-J is the likelihood of a major oil spill. The likelihood of a 100,000 bbl. spill from a platform is extremely low and approaches zero, especially when spill prevention practices, well control techniques and training are considered. Based on historical OCS data, a size-frequency correlation for spills of 100,000 barrels or greater is projected to be 0.036 spills per billion barrels of oil produced (See page IV - A - 7). This equates to an expectation of 0.05 spills of this size if <u>all</u> the oil projected for the North Aleutian lease sale area is produced (an assumption which itself has a low probability of occurrence - with the more likely case being less oil produced). This value is sufficiently low that it creates the question of whether a worst case analysis is even required. However, it is in the discretion of the agency to elect to follow a conservative approach as long as it is reasonable.

To conduct the worst case analysis, additional data gaps occur together with a wide variety of possible scenarios. The agency must use its discretion to select a plausible scenario and to use reasonable judgment in making the necessary additional assumptions. As long as reasonable discretion is used, the worst case analysis need not, indeed cannot, include all the infinite variations on scenarios.

The goal is to identify the key data gaps which reasonably could have major consequences for the impact evaluation. The assumptions made about such data gaps should be based on reasonable extrapolations from available data. Projections of consequences which, based on knowledge of species and ecosystems, have remote likelihoods of occurring are not required to be made.

The results of the analysis may necessarily be qualitative, rather than precisely quantitative, but they will provide the decision maker with a reasonable basis for understanding the potential types of threats to whales and the magnitude of risk of occurrence of such threats. These are the factors which are required in the regulation. The intent is to provide the decision maker with a tool for understanding the potential for occurrence of catastrophic events against which to weigh or balance the proposed activity.

This worst case analysis for whales, although it may not be required in the first instance due to the extremely low likelihood of the triggering event, meets the requirements of the regulation. It sets out for the decision maker an identification of the uncertainties which, in the worst case, could result in a catastrophic event. It also sets out the nature of the uncertainties, as well as of the event, and provides information on the level of likelihood of occurrence.

Specific comments on the analysis are provided below.

Page IV - J - 1, Assumption 10

Because the expected occurrence of a spill of 100,000 bbls is only 0.05 spills expected for production of all the oil projected in the maximum case (itself an unlikely event), the agency should not
8-102 be shy about calling the estimated probability of the assumption "low". The probability of a 100,000 bbl spill (especially in light of historical data, improved spill prevention and well-control techniques and training, and level of likelihood that the maximum case will occur) is not medium to low - it is plainly low.

Page IV - J - 2, Line 1

The maximum case is stated here to be 1.33 billion bbls. Yet at
8-103 page II - A - 1 and in Appendix A, the maximum case is stated to be 0.759 billion bbls. This would give an expectation of 0.03 spills of this 100,000 size. The text should be corrected to reflect this fact.

Page IV - J - 2, Assumptions 1-7

It may be helpful to the decision maker to provide an estimate of the likelihood of occurrence of each assumption. Assumption 1, as discussed above, would have a low likelihood. Assumption 2, contains two portions - the likelihood of the blowout being in the northeast portion, would depend on the geological assessment, and the likelihood that the well would not be ignited, would depend on numerous factors, including recognition that a serious threat to the whale population may be an important factor in a case where a decision to ignite might be made. Assumption 3 would have at most a medium likelihood, because there are substantial equipment and manpower resources available in Alaska and rapid access to equipment and manpower worldwide which could be mobilized. The clean up effort would consider any potential serious threat to whales and other vulnerable species, as have been identified in advance through the biological resources stipulation, environmental reports and impact statements for the specific project. Assumption 4, depends on the weather patterns for that portion of the Bering Sea - ice presence is variable throughout the April to December time frame but the likelihood is low and to have no storms in the Bering Sea for such an extended period is a low likelihood. Assumption 5 again has two parts with gray whales likely to be present at least for a time, and an uncertain likelihood of oil avoidance or detection. Assumption 6, estimated likelihoods are provided in part in assumptions 6 and 8 on page IV - J - 1, but should be clarified here. Assumption 7, has a very

low likelihood of occurring because there is a very high likelihood that if the Regional Supervisor determines that the whales will experience additional stress from acoustical disturbance after a large oil spill, then the RS will limit or suspend such noise-producing operations.

8-104 Page IV - J - 3&4, Fourth Paragraph

This discussion should point out that the described effects from seismic testing could be limited by suspension of such testing for the period of the migration if the Regional Supervisor determines it is necessary.

Page IV - J - 4, Second Paragraph

The analysis leaps to the conclusion that the worst case could result in a reversal of the currently increasing population trend. A statement as to the likelihood of all the negative events
8-105 occurring with all the uncertainties resolved against species adaptability and recooperative powers should be included. Additionally, even if there were reversal of the currently increasing population, would that reversal be a temporary plateau or dip, as seems most likely, or would it be a permanent plateau or dip? The question of the realistic long-term severity of the impact should be addressed together with its likelihood, both of which are likely to be low.

8-106 Page IV - J - 5 to 7: Right Whale

The comments pertaining to the gray whale apply also to the right whale analysis.

Page IV - J - 4, Assumption 2

Since right whales have not been sighted in the lease area (See Graphic 4 and pages III - B - 28 and 29), the probability that they would be feeding in the lease area would be low. 8-107

Graphic 1

It would be helpful to include latitude and longitude marks.

8-108 Appendix Table A-1

With reference to delineation wells, it should be noted that the defining of hydrocarbon accumulations and the strategic location of platforms in order to produce the oil efficiently, usually require an average of five delineation wells. The schedule appears to indicate installation of a production platform after the drilling of only three delineation wells. It is doubtful that a platform would be installed any earlier than 1991, because of the time required for securing necessary permits and for subsequent construction of the platform.

The oil pipelines as listed in the table would be unnecessary if an offshore loading terminal with crude tanker transport were used, as discussed in the Han Padron report.

8-109 A-3, Third Full Paragraph

The risks as indicated would be mitigated by utilization of an offshore loading terminal with crude tanker transport scenario.

8-110 Appendix, Table B-1

Same comments would apply that were made for Appendix Table A-1.

8-111 Appendix G

The assumption is being made that oil will be found in St. George Basin, Navarin Basin and Norton Sound. The appendix treats oil spill probability on this assumption and the assumption that Canadian tankers will be transecting the area. To simplify the tables, we feel the calculations should be for two cases. One for the cumulative case as shown, and the other for the North Aleutian Shelf case on a stand-alone basis. Throughout the Tables G-1 to G-27, there is indication that other spill sources are utilized that are not in the proposed sale area and also by the title, there is no suggestion that this is a study of a cumulative case. If that is the intent, the cumulative case, then the tables, as defined, would appear to be in order, however if this is not the intent, and implies only North Aleutian activity then many of the data points are not applicable to this Sale 92 area.

tp6:647

Response 8-1

The tanker size postulated is significantly smaller than the tankers currently used by industry to transport North Slope production, because the estimated resources of the proposal are significantly smaller than North Slope resources. The tanker size used in the transportation scenario for the EIS was selected to be commensurate with the resource level of the field. Industry representatives have informed us that a rotation of 3 to 4 days, at maximum, is preferred for the expeditious and economical use of terminal facilities. The 80,000-DWT vessel used in the analysis would visit the terminal every 5 to 7 days during peak production. During the decline of production, vessel visits would very quickly surpass a 10-day turnaround time.

Response 8-2

Although the potential onshore pipeline route from Herendeen Bay to Balboa Bay does not meet the federal criteria for a wilderness due to ownership and size, wilderness values can exist on private and state lands, and the EIS analysis has addressed those values. There are many other wilderness values on federal lands in addition to size and ownership (i.e., solitude, recreational value). Even though this area may not be officially designated as a federal wilderness area, the development of a pipeline on federal lands would impair existing wilderness values. As indicated in the effects definitions in Table S-1, a major effect for land use is defined as a "high incompatibility between an OCS facility and other uses;" wilderness values along the potential pipeline route are in this category.

Response 8-3

Table II-1 shows revised resource estimates for Alternative IV.

Response 8-4

The development and transportation scenarios selected for analysis for Alternative I in the FEIS include (1) a pipeline to Balboa Bay and (2) offshore loading. The offshore-loading-transportation scenario has been added as a transportation option for Alternative I and has been analyzed in Section IV.B.2. As indicated in the EIS, the selected scenarios do not represent an MMS recommendation, preference, or endorsement of facility sites or development schemes. The EIS would not preclude any development scenarios that may be applied to eventual resource development.

Response 8-5

The potential pipeline route shown in Figure II-2 was identified in the Bristol Bay Area Plan for State Lands (State of Alaska, 1984), the Bristol Bay Regional Management Plan (1985), and the Draft Alaska Peninsula National Wildlife Refuge Comprehensive Conservation Plan (USDOI, FWS, 1984). The pipeline route, which follows general transportation corridors identified in state and federal land-use plans, was selected for analysis purposes only. It is not the MMS's intention to identify precise final locations of facilities or pipeline routes. If economic reserves of hydrocarbons were discovered and pipelines were determined to be economically and environmentally advantageous, it would be industry's responsibility to work with the federal government, the State of Alaska, local-government agencies, and private landholders to route pipelines.

Response 8-6

The wording in this stipulation does not prohibit the use of other methods of hydrocarbon transportation or the use of offshore loading, providing that the conditions identified in the stipulation cannot be met. The referenced wording, ". . . following the development of sufficient pipeline capacity," as well as other parts of the stipulation, point out what will be required if pipelines are utilized. The first paragraph states that pipelines will be required "if . . . technologically feasible and environmentally preferable . . ." The last sentence of this paragraph states, "In selecting the means of transportation [of hydrocarbons], consideration will be given to recommendations of the Regional Technical Working Group . . ." The above wording recognizes that an option is available to the operator regarding the type of hydrocarbon transportation that may be used.

Response 8-7

The National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (FWS) are the agencies in which program responsibilities are vested. These agencies determine if an action poses potentially adverse effects on species that have been listed as endangered or threatened. If a "may-exist" situation is determined to exist, the MMS will make every effort to prevent adverse effects on endangered species from occurring. The Sale 80 (California) NMFS biological opinion stated that, although they did not find jeopardy to gray whales passing through the area, "Environmental conditions in Alaska are different." Since the NMFS has determined that conditions off California do not apply to conditions off Alaska, the MMS has proposed several mitigating measures to protect endangered whales from adverse effects. The Secretary of the Interior ultimately will determine which mitigating measures will be part of the conditions of the lease sale.

Response 8-8

The two paragraphs entitled "Information on Endangered Whales" are not redundant--one applies to noise disturbances and the other applies to oil spills.

Response 8-9

The Information to Lessees (ITL) on Endangered Whales has not been modified.

Response 8-10

The text (Sec. II.C.1.d.(1) of the FEIS) has been amended to address this concern.

Response 8-11

This issue is addressed in Response 8-3.

Response 8-12

Table II-2 (Sec. II of the FEIS) has been amended to reflect this concern.

Response 8-13

The two suggested sentence additions were considered but have not been included in the FEIS. The information in the first suggested additional sentence is inappropriate to the purpose of the table. The second suggested sentence is in error: Onshore oil-spill trajectories occur only during the seasons in which salmon are present.

The MMS agrees that most oil-spill risk to Resource Area 7 is caused by the assumed transportation scenario, which pipes all oil from the proposed sale area through the resource area. Most of the risk is not due to any inherent focusing of oil trajectories caused by local winds and currents.

Conditional probabilities are used to indicate risk (not effects) in the event that an oil-spill occurs. Factors that limit the effects on fisheries are discussed in the site-specific analysis in Section IV.B.1.a.(1).

All MMS OCS oil and gas lease sale EIS's are based on the unrisked-resource estimates and do not incorporate the likelihood that commercial quantities of oil might not be found.

Response 8-14

Based on the definitions assumed for the effects assessment (Table S-2), a major effect on the commercial fishing industry is defined as: "Major disruption to industry operations occurs. Conflicts are frequent and significantly affect the fishing industry. Economic loss to the commercial fishing industry exceeds 10 percent." The definition makes no reference to long-term effects. The summary indicates that, if a large spill occurred in the Port Moller area during the salmon, herring, or crab fishing seasons, the effects on the fishery would be major.

Response 8-15

The analysis of the local economy focuses on Cold Bay and Unalaska, which are support-base sites for exploration, development, and production activities. The projected increase in employment opportunities would not decrease joblessness in these affected communities (Sec. IV.B.1.b.(2) of the FEIS).

Response 8-16

This concern is addressed in Response 8-2.

Response 8-17

V-167

The analysis indicates that the effects resulting from Alternative IV are the same as those defined for Alternative I, except for endangered and threatened species and nonendangered cetaceans. The effects on these two groups were reduced from minor to negligible, except for the gray whale. Minor effects on gray whales are anticipated in both alternatives. The MMS feels that this is not an overstatement of the reduction in environmental effects under Alternative IV.

Response 8-18

The statement made in Section III.B.3. of the DEIS that certain pinniped species and sea otters ". . . may be adversely affected by proposed OCS oil and gas industrial activities . . ." explains why these species must be discussed in the EIS (versus discussing uncommon or rarely occurring species that are not likely to come near any OCS activities in the lease sale area). The statement was changed to ". . . may experience some interaction with OCS activities." (see Sec. III.B.3. of the FEIS).

Response 8-19

The statement ". . . in terms of potential adverse effects of oil and gas activities." in Section III.B.3. was not deleted; however, the text was changed to ". . . relevant to potential adverse

effects." (see Section III.B.3. of the FEIS). For further discussion, see Response 8-18.

Response 8-20

The text has been amended to address this concern (Sec. IV.B.1.a.(4) of the FEIS).

Response 8-21

The concluding sentence of Paragraph 1 in Section III.C.1.b. substantiates the reason for inclusion and discussion of the salmon fishery in this EIS.

Response 8-22

The text has been amended to address this concern (see Sec. III.D.5.a. of the FEIS).

Response 8-23

The history of the Endicott Field will not necessarily be repeated in the North Aleutian Basin. Endicott is being developed similarly to an onshore oil field--on a gravel island connected to shore by a gravel causeway. The reservoir characteristics of Endicott are known because exploration and delineation wells have been drilled and tested there. Until similar testing of a specific prospect/reservoir has occurred in the North Aleutian Basin, there is no reason to assume that the characteristics are the same. Seal Island is only a few miles from Endicott, yet it has significant reservoir differences compared to the Endicott. It also is customary for an oil company to request more drilling activity than may be needed so that some future unforeseen problem will not arise and require either another EIS or additional permits. This could or could not be the case at Endicott.

The exploration and development schedules do not include any delays for permitting and preparation of a production EIS, or for legal or other regulatory delays. Delays may occur, but there is no accurate way to predict when they will take place or how long they will last. The MMS schedules are compatible with the estimated scheduling shown in the National Petroleum Council Arctic Report (1981).

Response 8-24

The text has been amended to address this concern (see Sec. III.C.3. of the FEIS).

Response 8-25

The text has been amended to address this concern (see Sec. IV.A.1.b. of the FEIS).

Response 8-26

The text has been amended to address this concern (see Sec. IV.A.1.b. of the FEIS).

Response 8-27

The text has been amended to address this concern (see Sec. IV.A.1.c. of the FEIS).

Response 8-28

The text has been amended to address this concern (see Sec. IV.A.1.d. of the FEIS).

Response 8-29

The text has been amended to address this concern (see Sec. IV.A.1.d. of the FEIS).

Response 8-30

Based on the Han Padron Report ("Evaluation of Bering Sea Crude Oil Transportation Systems"), Section IV of the FEIS includes an evaluation of the potential oil-spill risks and the environmental effects of an offshore-loading-transportation system. If industry were to employ an oil-transportation system involving tanker loading at offshore terminals and routing of loaded tankers directly to markets, the MMS agrees that the oil pipeline and terminal described in Section IV.A.1.d. would not be necessary. However, a gas pipeline and an LNG plant would still be required, as detailed in Section IV.A.1.d.

Response 8-31

This concern is addressed in Response 8-1.

Response 8-32

The timeframe for barge traffic corresponds to the development-drilling period identified in Tables IV-1 and IV-2--between 1990 and 1993.

Response 8-33

The text has been amended to address this concern (see Sec. IV.A.1.e. of the FEIS).

Response 8-34

The text has been amended to address this concern (see Sec. IV.A.1.e. in the FEIS).

Response 8-35

The development-drilling period is expected to occur between 1990 and 1993 (as stated in Sec. IV.A.1.e.of the DEIS). Table IV-3 of the FEIS has been amended to address this concern.

Response 8-36

Table IV-3 has been amended to address this concern.

Response 8-37

The text has been amended to address this concern (see Sec. IV.A.1.d. of the FEIS).

Response 8-38

The text has been amended to address this concern (see Sec. IV.A.1.e. of the FEIS).

Response 8-39

The MMS uses tanker statistics for three reasons. First, foreign tankers are permitted to carry OCS crude under the same exemptions and conditions under which they now carry Prudhoe Bay crude. Second, the oil-spill-risk analysis includes tankering of both OCS and Canadian crude. Third, regulations governing both U.S. and foreign tankers are similar; both follow foreign regulations in foreign waters, U.S. regulations in U.S. waters, and international treaties in international waters.

No statistics or evidence were provided by the commentor to support the premise that U.S. tankers have a better record and operate under more stringent regulations. U.S. and most foreign regulations are based on international conventions and treaties, such as the International Convention for the Prevention of Pollution from Ships of 1973, as modified by the Protocol of 1978 (MARPOL 73/78). The U.S. tanker industry is currently before the U.S. Supreme Court to challenge an Alaskan law that forbids dumping of oily ballast water within 50 miles of Alaska's coastline. According to the Associated Press (1985) account, industry is arguing that "the dispute poses a serious threat to tanker shipping because other states could follow Alaska's lead and impose more stringent regulations than those imposed by the federal government."

The example given of the excellent tanker record for U.S. industry, ". . . 4 billion barrels of oil have been transported from Valdez without a significant oil spill." is in error. The Texaco Connecticut struck a bank in the Panama Canal on June 7, 1980, and ripped its No. 1 and No. 2 cargo tanks (Von Chong et al., 1983). The ship did not stop, but continued on, spilling 4,000 barrels of

Prudhoe Bay crude along half the length of the Panama Canal. This incident should be considered a "significant oil spill."

The available statistics do not allow one to conclude that the U.S.-flag-tanker record is better than the foreign-flag record, either within the international or the Alaskan crude trade. The U.S. tanker fleet has fourfold more spills annually than the Japanese tanker fleet (Oil Spill Intelligence Report, 1982a). In a comparison of international tanker spills on a country-by-country, fleet-tonnage basis, the U.S. tanker fleet was fourth highest in spillage rate (Bertrand, 1979). Within the Alaskan-crude trade, U.S.-flag carriers have had 3 spills of over 1,000 barrels, and Liberian tankers (which carry a significant percentage of Prudhoe Bay crude) have had no spills.

The avoidance of importing foreign crude is not a mitigating factor in the oil-spill-risk analysis for Alaskan OCS areas. Based on MMS spill statistics, the importation of foreign crude would be projected to result in 0.65 spills of at least 1,000 barrels per billion barrels transported and unloaded in U.S. waters. (That is, only half of the overall spillage would be assumed to occur in U.S. waters.) Production and transportation of North Aleutian Basin crude has projected spillage at the rate of 3.9 spills of at least 1,000 barrels per billion barrels produced and transported. Thus, Alaskan OCS-oil production and transportation poses a sixfold-greater oil-spill risk to U.S. waters than does importation of foreign oil.

The commentor states that only 2,988 barrels of crude were spilled by U.S. flag vessels from 1975 to 1983. These statistics are erroneous; more than this quantity of crude was spilled in a single event from a U.S. tanker carrying Alaskan crude (the Texaco Connecticut incident mentioned above).

Response 8-40

The MMS recognizes rationales for both inclusion and exclusion of airfield spills from the Alaskan record and, therefore, calculates the statistics for the Alaskan record both ways. The rationale for including the airfield spills is that the airfield, airfield-fuel tanks, and fueling operations exist or occur at Prudhoe Bay only because of the presence of the oil fields. For an offshore field, there would be no airfield, but instead an equivalent amount of traffic, fuel storage, and fuel transfers involving supply ships and/or helicopters.

Response 8-41

This concern is addressed in Response 4-14.

Response 8-42

This concern is addressed in Response 4-70.

Response 8-43

The MMS agrees. In the EIS, Canadian tankering is assumed to proceed southwestward through and past the Navarin Basin. The transportation scenarios used in the oil-spill-risk analysis have been clarified in Graphic 5. Canadian tankers do not use Unimak Pass.

Response 8-44

The 48-hour response time is an MMS, not a U.S. Coast Guard, requirement. The requirement is for response only and is not meant to imply that cleanup could be accomplished in this timeframe or that cleanup is even possible under the environmental conditions in which the spill occurred.

Response 8-45

The discussion of dispersants in cold waters in Section IV.A.3. has been rewritten and expanded as part of Section IV.A.4. of the FEIS.

Response 8-46

The suggested change has been incorporated in Section IV.A.4.a. of the FEIS.

Response 8-47

The suggested change has been incorporated in Section IV.A.4.a. of the FEIS.

Response 8-48

The commentor is correct. The MMS will require skimmers in the North Aleutian Basin to be capable of operating in 8- to 10-foot seas and 20-knot winds, with deployment to be accomplished in 5- to 6-foot seas. Alaska Clean Seas already has such skimmers on call at Dutch Harbor, as is now noted in Section IV.A.4. of the FEIS.

Response 8-49

The text (Sec. IV.A.6.a. of the FEIS) has been amended to indicate that the potential exploration and production activities resulting from prior and future OCS lease sales could contribute to cumulative effects in the North Aleutian Basin lease sale area.

Response 8-50

If an oil-transportation system involving tanker loading at offshore terminals and routing of loaded tankers directly to markets were employed, the MMS agrees that the concerns relating to an oil pipeline across the Alaska Peninsula and a terminal at Balboa Bay would be eliminated. Based on the Han Padron report, Section IV.A.6.b. of the FEIS has been amended to include an analysis of offshore loading in conjunction with Alternative I (Proposal).

Response 8-51

Because aromatic compounds in crude oil spilled in the southeastern Bering Sea have been estimated to weather in 10 to 12 days, as cited in the EIS (Hameedi, 1982), the potential effects of such exposures must be considered in the analysis.

Response 8-52

Although the effects of exposure to aromatic hydrocarbons in the marine environment cannot be precisely predicted based on existing bioassay results, bioassay data provide a summary of known (i.e., observed) potential effects that are useful in assessing potential effects. As cited in the EIS, aromatic hydrocarbons may persist in the southeastern Bering Sea for 10 to 12 days, which would exceed the 96-hour exposures in the bioassays. It also is stated in the DEIS that "Direct mortality of fish and invertebrates occurs rapidly after exposure to oil. Fish exposed to fractions of Cook Inlet crude oil died rapidly, showing little additional mortality 2 to 4 days after exposure (Hameedi, 1982); exposures following an oil spill in the North Aleutian Basin could exceed this time period."

Response 8-53

For the purposes of analyzing effects on fisheries resources, the concentration of the water-soluble fraction of crude oil, as measured in parts per million (ppm), is compared to concentrations (also in ppm) known to have some level of effect (i.e., sublethal, LC_{50}, total mortality). The percentage of the water-soluble fraction of crude oil is not necessary for this comparison.

Response 8-54

The discussion of laboratory toxicity studies in Section IV.B.1.a.(1)(a) is intended to describe effects that have been observed from both lab and field studies, thereby identifying the range of potential effects that could result from a spill in the North Aleutian Basin. Such a discussion is applicable to any analysis of oil-spill effects on fish in this region.

Response 8-55

Exposure time from the cited studies has been included in the FEIS.

Response 8-56

The observations on drilling-mud dispersion are not applicable to oil-spill dispersion. The discussion in this portion of the document is related only to the observed effects of lab and field studies. Dispersion of oil in the water column is in Section IV.A.3.d.

Response 8-57

The discussion of formation waters in this portion of the EIS is intended only to describe observations of the effect of formation waters in a generic sense, without drawing a conclusion. Conclusions on effects of formation waters (as well as other factors) appear later in the section.

Response 8-58

This concern is addressed in Response 4-86.

Response 8-59

It is agreed that oil and gas structures provide a hard-bottom substrate and are used by hard-bottom and reef species. However, because only two oil and gas production platforms are projected for the North Aleutian Basin, the increase in biomass and productivity would be extremely minor. For this reason, this aspect has not been included as a positive effect.

Response 8-60

The discussion of effects by habitat types describes the potential generic effects of oil-spills and discharges on fisheries resources in pelagic, benthic, and nearshore habitats. These discussions are designed to provide a basis or background for a more quantitative analysis of effects, which occurs later in the Section IV.B.1.a.(1) (of the FEIS). Further, the fact that NPDES permits are required does not necessarily preclude the effects from drilling discharges from occurring. Therefore, a discussion of potential effects from discharges is warranted.

Response 8-61

The text has been amended to state that the effects that were documented following the Amoco Cadiz spill resulted from the combined effects of spilled oil and applied dispersants.

Response 8-62

Based on the Han Padron Report ("Evaluation of Bering Sea Crude Oil Transportation Systems"), Section IV of the FEIS includes an evaluation of the potential oil-spill risks and the environmental effects of an offshore-loading transportation system. If industry were to employ an oil-transportation system involving tanker loading at offshore terminals and routing of loaded tankers directly to markets, the MMS agrees that the oil pipeline and terminal described in Section IV.A.1.d. would not be necessary and the risk of oil spills contacting the herring populations along the southern coast of the Alaska Peninsula would be reduced. However, a gas pipeline and an LNG plant would still be required, as detailed in Section IV.A.1.d.

In the cumulative scenario, the routing of tankers through Unimak Pass would increase the risk of oil spills contacting halibut and pollock spawning grounds and winter groundfish concentrations south of Unimak Island.

Response 8-63

The conclusion of effects on groundfish has been clarified (see Sec. IV.B.1.a.(1) of the FEIS).

Response 8-64

Even though the probability of a major effect on red king crab populations is low, it does not diminish the magnitude of such an effect if it did occur. The probability of the occurrence of an effect does not necessarily equate to the magnitude of the effect.

Response 8-65

A discussion of factors that would limit the risk to king crab has been included in the FEIS (Sec. IV.B.1.a.(1)).

Response 8-67

The phrase "0.1 part per million" refers to the water-soluble fraction; this distinction has been included in the FEIS.

Response 8-68

Based on the Han Padron Report ("Evaluation of Bering Sea Crude Oil Transportation Systems"), Section IV of the FEIS includes an evaluation of the potential oil-spill risks and the environmental effects of an offshore-loading transportation system. If industry were to employ an oil-transportation system involving tanker loading at offshore terminals and routing of loaded tankers

directly to markets, the MMS agrees that the oil pipeline and terminal described in Section IV.A.1.d. would not be necessary and that the risk of oil spills contacting seabirds along the southern coast of the Alaska Peninsula and in the Shumagin Islands would be reduced. However, a gas pipeline and an LNG plant would still be required, as detailed in Section IV.A.1.d.

In the cumulative scenario, the routing of tankers through Unimak Pass would increase the risk of oil spills contacting seabird colonies on Unimak Island and in the Fox Islands.

Response 8-69

The text has been amended (see Sec. IV.B.1.a.(2) of the FEIS).

Response 8-70

The cause of the oil spill in the Persian Gulf has no bearing on the consequences of the damage to the ecosystems affected.

Response 8-71

The NMFS determines whether or not a population should be listed as endangered. Since the NMFS gives no guidance as to when a population is "biologically endangered," it would be presumptuous for the MMS to make that determination.

Response 8-72

On a short-term basis, it appears that gray whales are not harmed by a transient exposure to spilled oil. However, long-term, cumulative effects from repeated or prolonged exposure to hydrocarbons probably could harm gray whales. There is no indication that long-term, cumulative exposure to hydrocarbons is not harmful to gray whales.

Response 8-73

Section IV.B.1.a.(4) does not state that there would be a medium to high probability of oil contacting a whale, but that there is a range of probabilities of oil, if spilled, contacting preselected target areas. The text does state that the effects of an oil spill are likely to be minor on a regional basis.

Response 8-74

Based on the Han Padron Report ("Evaluation of Bering Sea Crude Oil Transportation System"), Section IV of the FEIS includes an evaluation of the potential oil-spill risks and the environmental effects of an offshore-loading transportation system. If industry were to employ an oil-transportation system involving tanker loading at offshore terminals and routing of loaded tankers directly to markets, the MMS agrees that the oil pipeline and terminal described in Section IV.A.1.d. would not be necessary and the effects on the commercial fishing industry would be reduced. However, a gas pipeline and an LNG plant would still be required, as detailed in Section IV.A.1.d.

Response 8-75

Communication and cooperation between the oil and fishing industries would mitigate interference with fishing gear by supply boats, and limited vessel trips would have a limited potential to contact fixed gear as compared with other vessel activity in the region. This would be the optimum means of avoiding conflict. However, it would be most difficult for a supply boat to navigate through some intensively fished areas or even to observe, and then to avoid, isolated fixed gear under adverse weather and sea conditions or at night.

Response 8-76

The text (Sec. IV.B.1.b.(1) of the FEIS) has been amended. However, additional support facilities may be required, depending on the location and size of any discovery of offshore oil and gas; therefore, the statement in the DEIS is correct.

Response 8-77

This concern is addressed in Response 8-43. The reference to Canadian production being tankered through the lease sale area and the Unimak Pass has been deleted from the text (Sec. IV.B.1.b.(1) of the FEIS).

Response 8-78

The text has been amended to address this concern (see Sec. IV.B.1.b.(3) of the FEIS).

Response 8-79

Based on the Han Padron Report ("Evaluation of Bering Sea Crude Oil Transportation System"), Section IV of the FEIS includes an evaluation of the potential oil-spill risks and the environmental effects of an offshore-loading transportation system. If industry were to employ an oil-transportation system involving tanker loading at offshore terminals and routing of loaded tankers directly to markets, the MMS agrees that the oil pipeline and terminal described in Section IV.A.1.d. would not be necessary, and that effects on subsistence-use patterns would be reduced. However, a gas pipeline and an LNG plant would still be required, as detailed in Section IV.A.1.d.

Response 8-80

The text has been amended to address this concern (see Sec. IV.F.1.a. of the FEIS).

Response 8-81

The text has been amended to address this concern (see Sec. IV.F.1.a. of the FEIS).

Response 8-82

The summary statement for the subsection on regulated discharges from platforms indicates that the water-quality effects from the discharge of drilling fluids would be minor.

Response 8-83

The text has been amended to address this concern (see Sec. IV.F.1.a. of the FEIS).

Response 8-84

The text has been amended to address this concern (see Sec. IV.F.1.a. of the FEIS).

Response 8-85

The "small area" referred to is essentially a point source for all projected emissions. In actuality, exploration and production would occur on at least one platform, which is, of course, somewhat larger than a point. This would result in only slightly more diffuse pollutant concentrations at the shoreline.

Table IV-19 and the appropriate text have been amended to address the concern that the proposed lease sale boundary is at least 18 kilometers from shore at its closest proximity (Sec. IV.E.1. of the FEIS).

Response 8-86

Table IV-20 demonstrates that air-quality limitations should not be exceeded during exploration drilling; consequently, the use of slant or directional drilling should not be necessary during exploration. During development and production, the same air-quality limitations could be exceeded. These drilling techniques have limitations on their flexibility and distance from a desired location; however, they represent only two of several options available to producers to meet air-quality standards.

Response 8-87

The reference to Fleury (1983) has been added to the FEIS bibliography. However, the Fluery paper contains no statistical analysis to support its conclusions. Fleury suggests that the rate of drilling blowouts decreased since 1978 because of stronger federal training requirements. This statement may or may not be correct. Fleury's data calculate to a 1979-1982 average of 3.61 blowouts per 1,000 wells, higher than the 3.12 blowouts per 1,000 wells over the prior 23 years. Thus, the rate of blowouts did not decrease, as suggested by Fleury, but instead increased. Because of the high year-to-year variation, and thus the high standard deviation, the apparent historical increase in blowout rate is not statistically significant, nor is it reflected in the OCS record for major oil blowouts of 1,000 barrels or more.

Response 8-88

This concern is addressed in Response 8-85.

Response 8-89

As indicated in Section II.C.1.b. (Potential Mitigating Measures), the analysis in this EIS does not assume that potential mitigating measures are in place. The effects of these measures are evaluated in Section II.C.1.d. (Effectiveness of Potential Mitigating Measures).

Response 8-90

The text has been amended to address this concern (see Sec. IV.F.4. of the FEIS).

Response 8-91

Although it is true that construction and maintenance vehicles would in all likelihood be confined to a road paralleling the pipeline, their presence is inconsistent with a wilderness experience. As indicated in the text, vehicle visibility and noise would create an unnatural situation that would impair wilderness values.

Response 8-92

The text has been amended to address this concern (see Sec. IV.F.5.a.(1) of the FEIS).

Response 8-93

Based on the Han Padron Report ("Evaluation of Bering Sea Crude Oil Transportation Systems"), Section IV of the FEIS includes an evaluation of the potential oil-spill risks and the environmental

effects of an offshore-loading transportation system. If industry were to employ an oil-transportation system involving tanker loading at offshore terminals and routing of loaded tankers directly to markets, the MMS agrees that the oil pipeline and terminal described in Section IV.A.1.d. would not be necessary and that the effects on wilderness resources would be reduced. However, a gas pipeline and an LNG plant would still be required, as detailed in Section IV.A.1.d., and could create major effects in the Port Moller/Balboa Bay transpeninsula corridor and at Balboa Bay.

Response 8-94

The fact that energy facilities are a land use about which the state is concerned, and that those facilities are to be accommodated in the coastal zone, does not preclude the possibility that siting these facilities may conflict with state policies that guide where such facilities are to be located. When such conflicts are identified, mitigating measures, alternative sites, or a finding that there are no reasonable and prudent alternatives may be used singly or in combination during the siting process. The conclusion of moderate effects indicates that such processes may be required during the siting of facilities, as hypothesized in the EIS.

Response 8-95

This sentence states, "With this alternative, effects on all endangered whale species are expected to be negligible, except for the gray whale which is more susceptible to oil spills farther offshore; and risks to nonendangered cetaceans are reduced to negligible." The conclusion for endangered species is supported in Section IV.E.1.d.(1), which states, "Effects resulting from this alternative are expected to be reduced from minor under the proposal to NEGLIGIBLE for all endangered cetaceans except the gray whale, for which risks would be the same as for the proposal (MINOR)." The conclusion for nonendangered cetaceans is supported in Section IV.E.1.e., which states, "Effects resulting from this alternative are expected to be reduced to NEGLIGIBLE, from MINOR for the proposal."

To eliminate confusion as to why the conclusion for gray whales remains minor, the clause on gray whales has been amended and a reference to Sections IV.E.1.d. and e. has been included in Section IV.F.5.b.(2) of the FEIS.

Response 8-96

As discussed in Section IV.B.1.a.(1) (Geophysical [Seismic] Survey Effects), few mortalities are expected from seismic surveys utilizing the preferred energy source, airguns, which have a lethal radius estimated at 0.6 to 1.5 meters. This statement--that some mortality of fisheries resources may be unavoidable--considers mortality that would result from seismic activities, discharges, and oil-spill contact, collectively.

Response 8-97

This concern is addressed in Response 8-93.

Response 8-98

This concern is addressed in Response 8-2.

Response 8-99

The text has been amended to address this concern (see Sec. IV.I.2. of the FEIS).

Response 8-100

The acknowledgment that social and cultural changes (including material culture) could ensue from the proposal recognizes the inevitable complex processes that characterize industrial development in a rural, subsistence-based environment. Thus, as stated in Section IV.I.3, "The proposal could contribute to irreversible changes in cultural values and orientation."

Response 8-101

The terms low, medium, and high were chosen to differentiate from those terms used to indicate levels of effects in Section IV. The Council on Environmental Quality (CEQ) does not require that the probability of occurrence be factored into the worst-case analysis; the CEQ requires the MMS only to weigh the risk of proceeding with the action and the potential consequences of such proceeding.

Response 8-102

Although the current spill rate is low, it will fluctuate depending on future oil-reserve discoveries. Since the oil industry has shown a strong interest in the North Aleutian Basin, it is assumed that there is a high potential for discovering commercial quantities. An historical review of spill rates indicates that higher losses occur when numerous exploration or production activities are ongoing and fewer losses occur when these activities slow down. As activities in the North Aleutian Basin increase, it is expected that spill rates will follow the rise in activities. Therefore, the probability of a large spill (assumption No. 10 in Sec. IV.J.1. does not specify 100,000 bbls) could range from medium to low during the gray whales' high-use period.

Response 8-103

As requested, the text has been amended to clarify that Scenario Items 1 through 7 are not assumptions, but rather describe the scenario used in the worst-case analysis (Sec. IV.B.1.a.(4) of the FEIS). The estimate of likelihood of the worst case occurring is stated in the conclusion.

Response 8-104

As stated in Section II.C.1.b., ". . . analysis in this EIS does not assume that the following mitigating measures are in place." However, should the Secretary decide to include the ITL on seismic activities and endangered whales, then the analysis would be different.

Although it is true that the Regional Supervisor, Field Operations, could limit or suspend seismic activities, if he were to do so, a "worst case" would not exist. Therefore, for this analysis, it was not considered valid that seismic activities would be altered or terminated.

Response 8-105

The conclusion states the likelihood of all negative events occurring. The severity of the long-term effect is unknown; thus, a worst-case analysis was prepared.

Response 8-106

This concern is addressed in Response 8-105.

Response 8-107

Historically, right whales occurred in the lease area during the summer. The predominant summer activity is feeding, which replenishes blubber stores lost during the winter-migration periods. Therefore, should right whales occur in the lease area during the summer, all scientific data lead to the prediction that the whales would be feeding at that time.

Response 8-108

In its projection of delineation wells, the MMS attempts to count only those delineation wells that will remain so classified. However, some of the delineation wells presently perceived for the Endicott Field may be converted later to productive wells.

Response 8-109

It is agreed that the use of an offshore-loading scenario for hydrocarbon transportation would alleviate the need for pipelines and reduce the environmental effects resulting from the maximum-case scenario (Appendix A). However, the analysis in the maximum-resource case is based on the use of pipelines as the system for hydrocarbon transport. Based on the Han Padron Report ("Evaluation of Bering Sea Crude Oil Transportation Systems"), the EIS has been amended to include an evaluation of potential oil-spill risks and environmental effects of an offshore-loading-transportation system under the proposal (Alternative I).

Response 8-110

This concern is addressed in Response 8-108.

Response 8-111

The column headings of all combined-probability tables in Appendix G (Tables G-10 through G-15) include information as to whether the tables apply to the proposal, the Alaska Peninsula deferral alternative, or the cumulative case (with proposal). The conditional probabilities of Tables G-1 through G-9 are not dependent upon or referenced back to the proposal, the alternative, or the cumulative-case scenarios.

9

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March 13, 1985

Mr. Alan Powers
Regional Director
U. S. Department of the Interior
Minerals Management Service
Alaska OCS Region
P.O. Box 101159
Anchorage, Alaska 99510

Re: North Aleutian Basin OCS Lease Sale No. 92 Draft Environmental Impact Statement (DEIS)

Dear Mr. Powers,

Sohio Alaska Petroleum Company is pleased to submit these comments on the North Aleutian Basin OCS Lease Sale No. 92 DEIS. In addition to our comments, Sohio endorses comments submitted by the Alaska Oil and Gas Association.

MMS is to be commended for preparing an objective, thorough and comprehensive analysis reflecting the large body of environmental data accumulated in recent years. The conclusions in the DEIS, for the most part, unequivocally support Sohio's belief that oil and gas exploration and development in the North Aleutian Basin pose only a minimal risk to environment, including the world-class fishery resources. The effects of the proposal (Alternative 1) on fishery resources, including salmon, herring, groundfish and crab are projected in the DEIS to be MINOR. Effects on endangered whales are estimated to be NEGLIGIBLE or MINOR.

Sohio, thus, strongly recommends proceeding with the sale as scheduled with the proposed action (Alternative 1). The possible environmental effects of this lease sale, as described in the DEIS, are projected to be MINOR or NEGLIGIBLE and do not justify cancellation of the sale (Alternative II), delay of the sale for five years (Alternative III) or deletion of all tracts within 25 miles of the coastline (Alternative IV).

Sohio believes that the North Aleutian Basin has significant oil and gas potential. In 1984 this areas was rated second in interest of all the OCS areas by the oil industry; this rating was in response for comments on a new five year OCS lease sale schedule. It was ranked third in resource

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potential of the 13 planning areas offshore Alaska. Industry interest in this lease sale can be characterized as high. The relatively low resource estimates presented in the DEIS are inconsistent with Sohio's estimate of the area's potential. In addition, Alternative IV (deletion of tracts within 25 miles of the shoreline) would remove a significant portion of the prospective acreage. MMS should revise its resource estimates for both the sale-wide area and the area proposed for deletion undar Alternative IV.

Sohio, which has conducted its own review of the environmental data base in the Bering Sea[1], believes that sufficient information to make an informed judgment on leasing does exist, and therefore, a delay of the sale is not warranted.

Our comments are divided into general and specific which are referenced by page, section, and paragraph. If you have any questions on our comments, please contact the undersigned (907-564-5473).

Yours sincerely,

Bruce I. Clardy

Bruce I. Clardy
Exploration Operations Supervisor

PTH/lls/2577T

(1)Lewbel, G. S. (ed.). 1983. Bering Sea Biology: An evaluation of the environmental data base related to Bering Sea oil and gas exploration and development. LGL Alaska Research Associates, Inc., Anchorage, Alaska, and SOHIO Alaska Petroleum Company, Anchorage Alaska, IV + 180 pp.

GENERAL COMMENTS

1. DEVELOPMENT SCENARIOS

9-1

The exploration and development scenarios described in Section IV A. 1 and Table IV-1 and IV-2 are very optimistic and unrealistic. First, the development time frames indicate first oil production only eight years after the lease sale; we believe that oil production in Alaskan frontier areas would occur a minimum of ten years and more likely twelve years after the lease sale assuming commercial discoveries.

Installation of the first platform is shown to occur only five years after the lease sale. Permitting, engineering design and construction of a large integrated drilling/production platform and other development facilities would take about five years <u>after</u> a commercial discovery has been made and delineated. Also, the scenario shows a hiatus of four years between platform installation and commencement of production and two years between drilling and production. Depending upon the platform design and the transportation system selected, production could commence as early as one year from the date of platform installation.

9-2

Alternative 1 assumes that oil production would be pipelined to shore to a terminal located on the south side of the Alaska Peninsula. We believe that offshore loading directly to tankers should have also been considered in the DEIS; this is a highly feasible economic and engineering option that should be available to industry. Offshore loading has proven to be a safe, environmentally compatible production/transportation system that has been used successfully worldwide (including in the harsh environment of the North Sea). Offshore loading (which has been evaluated in depth for MMS by Han Padron) could obviate the need for extensive pipeline construction and the construction of a terminal on the Alaska Peninsula. The DEIS should therefore evaluate the potential spill risks and environmental effects of this development alternative.

9-3 The Alternative 1 scenario portrays a most circuitous offshore pipeline route through Port Moller and Herendeen Bay rather than a direct landfall which would probably be technically, economically, and environmentally more feasible.

2. OIL SPILL RISK ANALYSIS

9-4 Sohio would like to commend MMS on the format and general quality of writing presented in the Oil Spill Risk Analysis, Section IV.A.3. Although this section far surpasses other previous EIS risk analyses, one consistent problem still exists. There is no presentation of the Alaskan petroleum industry's excellent spill response and cleanup record. Industry has a very low record of large spills during drilling operations (as defined by text as > 1000 bbls) and major achievements in spill response research and technology.

Three reports, their titles follow, summarize a number of industry advancements in spill response:

1. Oil Spill Response in the Arctic, An Assessment of Containment, Recovery, and Disposal Techniques

2. Oil Spill Response in the Arctic, Part 2, and 3. Field Demonstrations in Broken Ice.

Many of the techniques and considerations presented in these publications refer to the Beaufort Sea region. However, the majority of concepts introduced are appropriate for all arctic regions such as the Bering Sea.

3. EFFECTS ON FISHERIES AND FISHING INDUSTRY

The DEIS takes a conservative analytical approach and makes a thorough review of the extensive data base with respect to potential effects on the fishery resources of the North Aleutian Basin lease sale area. Sohio concurs with the conclusion that effects on the fishery resources would be NEGLIGIBLE or MINOR.

With respect to the potential effects on the fishing industry, which the DEIS projects to be generally MINOR, we believe that the analysis could have been broader and more balanced. Through a review of oil industry-fishing interactions elsewhere in Alaska, the lower 48 and overseas, a less speculative approach could have been taken. The DEIS concludes that the effects on the commercial fishing industry, such as gear conflicts, harvest loss, closure of fishing grounds, and competition for support services would be MINOR.

9-5 Indeed, there would be positive effects on the fishing industry related to improvements in weather observations, transportation, and port infrastructure and safety at sea through improved air/sea rescue capabilities. The DEIS should note that there have been no documented significant impacts from oil development to the fishery resources in areas of offshore production in the U.S. principally the Gulf of Mexico, California, and Cook Inlet. Indeed the fisheries of the Gulf of Mexico and Cook Inlet have thrived during this period of offshore oil and gas development. Mention should also be made of regulatory safeguards, such as the Federal Oil Spill Pollution Fund as well as potential civil liability settlements to mitigate any adverse economic effects of an oil spill.

The efforts and accomplishments of the oil and fishing industries to improve communications and avoid or mitigate conflicts through such organizations as the Oil/Fisheries Group of Alaska should be more fully acknowledged.

4. WORST CASE ANALYSIS

9-6 It is appreciated that the worst-case analysis on gray and right whales was deliberately intended to overstate any conceivable situation; that this approach was probably taken to ensure that the EIS meets NEPA and CEQ requirements. However, the projected situation and impacts are so exaggerated that the analysis bears no connection with reality and, in our opinion, far exceeds the intent of CEQ regulations. It so distorts a worst-case consideration that a reasonable perception is not possible. We encourage MMS to base worst-case analysis on scenarios that are realistic.

DETAILED COMMENTS

Page II-C-5, Stipulation No. 5, Transportation of Hydrocarbons

9-7 The DEIS has not shown that pipelines are environmentally or technically preferable to offshore loading systems to support this stipulation. It would be appropriate for the DEIS to evaluate the environmental risks (spills etc.) of offshore loading systems since the implication of this stipulation is that they are less preferable than pipelines with respect to environmental effects and risks. This is not the case when the record is reviewed.

Page II-C-11, Information on Potential Gear Conflict with Commercial Fishing Industry

9-8 Through the auspices of the Oil/Fisheries Group, there is an on-going voluntary program to avoid gear conflicts as described in "A Manual for Geophysical Operations in Fishing Areas of Alaska." In addition, information on rig moves and drilling activities has been exchanged.

Page IV-A-1, Section IV.A.1

See our General Comment No. 1

Page IV.A.2, Anticipated Seismic Activity

9-9 This section should more clearly differentiate regional seismic survey activities conducted before the sale and site specific geohazard surveys conducted at specific drillsites or geologic structures after the lease sale.

Page IV.A.4, paragraph 4

9-10 The DEIS should clearly note that the onshore infrastructure requirements will depend upon the location and characteristics of a commercial discovery and other site specific considerations. As such, the designation of predetermined onshore pipeline corridors does not provide planning and regulatory flexibility, especially since detailed site specific engineering and environmental surveys have not been conducted in these corridors.

Page IV-A-7, paragraph 5

9-11 The statement that "the pipelines spill rate has not improved over time, ..." does not agree with findings published in a recent paper presented at the 1985 Oil Spill Conference (attachment 1) by Yoshioka et. al. entitled "Patterns and Trends in Reported Small Oil Spills." Large spills from pipelines were stated to have decreased since 1974 while small ones (< 100 gallons) have increased. This trend is attributed to technological advances and spill prevention programs (causing reduction of larger spills) along with stricter reporting regulations (encouraging the reporting of smaller spills).

Page IV-A-8, paragraph 1

9-12 The use of world-wide tanker data may not be appropriate. Because foreign flag tankers may not necessarily be subject to the strict marine transportation regulations imposed on U.S. tankers, their spill risk is greater than U.S. vessels. It may be more appropriate to use only U.S. statistics and/or discuss the U.S. imposed spill prevention and response sanctions.

Page IV-A-8, paragraph 2

9-13 The reasons given for the observed drop in spill statistics for tanker spills were stated to be only postulated but not statistically proven. Both papers, Lanfear and Amstutz (1983) and Yoshioka (1985) state these same reasons for trend reduction. Reasons why this information can not be statistically proven should be given.

Page IV-A-8, paragraph 3

9-14 With respect to the statement that "... the only possible comparisons of OCS statistics with Alaskan data are for the state-leased offshore Cook Inlet and Prudhoe Bay/Kuparuk fields," the DEIS should note that the Prudhoe Bay/Kuparuk fields are not situated on offshore lease tracts.

Page IV-A-8, The Alaskan Record

MMS is to be commended for inclusion of this section in the DEIS. The oil industry has been operating offshore in Alaska for more than 20 years (specifically in the Cook Inlet) and the operating record for this area should be addressed along with the OCS statistics. However, the dilemma in including this information in the EIS is the creation of additional statistics to verify and question. The following comments are directed toward the information in this section.

9-15 Sohio does not agree with the hypothesis that spills from commercial activities located adjacent to an oil production field should be included in the risk analysis for that field. Spill rate predictions are based on two assumptions: (1) future spill frequencies based on past OCS experience and (2) spill rates dependent upon the volume of oil produced or transported. Service companies with no direct connection with oil field production do not fall within these assumptions. In addition, spills which are not directly controllable by the field should not be considered statistically associated. Using the Panamanian tanker spill under the Prudhoe Bay/Kuparuk category in Table IV-7 as an example is totally inappropriate. However, spills of Prudhoe Bay crude occurring within the Port of Valdez during transfer from the terminal to a tanker would be representative of an incident associated with North Slope operations. Nevertheless, a spill from this same tanker in Panama would not be representative since control over the tanker is no longer with Alyeska operations. The use of the Panama spill or associated hypothesis creates a cradle to grave responsibility for oil production fields; a service station spill of Prudhoe Bay crude refined product occurring in New York could then be used as a statistical spill if this reasoning is followed.

Page IV-A-9, Table IV-7

9-16

This table may not present an accurate picture of Alaskan spill history. The desire to support OCS statistical predictions is understood; however, this should not create data which may not truly be representative of the Alaskan spill history. Using statistical records obtained from the Oil Pollution Section of the Fairbanks ADEC office, the following comments are directed to Table IV-7:

(a) More complete referencing of statistical sources is needed to allow for verification of data by the reader. The range of dates in which the spills were observed would also be helpful. ADEC has reported spill records on a lexitron system for years 1979 to present. They encourage the use of this system by MMS when compiling tables such as this one to ensure data accuracy. This would work both ways. In the case of a MMS known spill that has not been reported in ADEC records.

(b) Platform spills - As result of the oil industry's activity on the North Slope and Offshore Beaufort Sea, reported spill statistics indicate there have been no 1,000 bbl or larger spills from platforms.

(c) One of the airfield spills noted for Prudhoe Bay/Kuparuk resulted from leakage of underground fuel tanks belonging to a commercial carrier line. This incident has no connection with oilfield operations and could occur from any airfield in the U.S. There is no ADEC record for the other noted airfield spill. See comment (a).

(d) Tanker spills: Based on ADEC spill report records and discussions Alyeska Pipeline Service Company no spill of 1000 bbl or greater has resulted from tanker activity in Alaska. If this is a spill which occurred outside of Alaska, it should be so stated. Also, see our comments above directed to the Alaskan record section.

Page IV-A-10 through 12, Table IV-8, Figures IV-1 and IV-2

9-17 When predicting cumulative impacts, production schedules for the various lease sale areas should be given to allow for consistency evaluation.

Page IV-A-14, paragraph 3

9-18 With respect to the statement (lines 10-12) that "Dispersants work most effectively on this, fresh oil slicks and in temperate waters ..." the DEIS should note thet there are a number of dispersants which have been designed for cold water use. Corexit 9550 and BP MA700 are two examples. The American Petroleum Institute is in the process of publishing a report entitled "The Role of Chemical Dispersants in Oil Spill Control". The most significant factors influencing dispersant effectiveness are oil viscosity, pour point, and oil composition. A number of successful cold water dispersant tests were conducted through Alaska Clean Seas in 1979. Information can be obtained from ARCO.

Page IV-A-16, paragraph 4

9-19 The Alaskan Beaufort Sea Oilspill Response Body (ABSORB) charter was amended in 1983 to create a statewide industry cooperative-type organization known as Alaska Clean Seas. This change was based on lease sale opportunities and resulting exploration activities throughout the offshore areas of the State. Navarin Basin is the newest CPA formed (this should be included in your text) joining the ABSORB, Norton Sound, St. George Basin, and GOACO CPA areas already mentioned. The ABSORB CPA has also recently been expanded to include the Sale 87 lease area.

Page IV-A-17

9-20 The DEIS states that the best skimmers would work only in seas up to 8 feet and that this would prohibit their use as a response technique 50 percent of the time in winter and 10 percent of the time in summer. This evaluation of oil spill response for the Bering Sea is very restrictive and has disregarded other viable techniques such as the use of dispersants and insitu burning. Natural dispersion, dissolution and evaporation of oil would be optimum in the extreme sea states noted. Shoreline protection operations can also be accomplished without mobilizing to sea. These concepts, along with the successful use of dispersants in high sea states, were recently observed during the Puerta Rican spill incident offshore of San Francisco.

It should also be noted that during the winter extreme sea state condition, biological activity is at a minimum and sensitive coastlines are protected by an ice and snow cover.

In addition, this discussion overlooks a regulatory safeguard set up to ensure industry response capabilities. OCS Order No. 7 requires that a leasee have the capability to respond and clean up spills under reasonable conditions or permits to drill will not be issued.

Page IV-B-50, paragraph 4.

Fraker et al. (1978) reported that belugas moved away from a barge tow. The range at which the reaction was seen was about 2400m (approximately 1.5 miles), and the situation was relatively confined (i.e. shallow water), a circumstance in which a greater response would be expected.

Echolocation signals are of high frequency (2-120+ kHz), well above the
9-21 frequency range produced by industry operations. Therefore, echolocation
signals are not prone to being masked by industry sounds.

It should be remembered that there are hundreds of fishing vessels that operate in the Sale 92 area. Vessel traffic from the oil industry would represent a small incremental increase, and not the introduction of a new type of disturbance. (Vessels are the most common and wide-spread 'noise sources' related to offshore petroleum operations.)

Page IV-B-51, paragraph 4

The 10-20 percent mortality figure mentioned seems high. It is not clear
9-22 how this figure was derived.

Page IV-B-59, paragraph 4

The 185km figure given here is a theoretical distance over which certain
industry sounds may be detectable by marine mammals. This figure should be
more qualified than it is in the text. Apparently it is based on
theoretical calculations rather than field measurements. In practice,
9-23 sounds travel much less efficiently than calculations would indicate, and
the 185km figure probably exaggerates the situation to a large degree.
Although not stated, the sound involved in the theoretical calculation
presumably was a seismic sound rather than machinery sounds, which are
orders of magnitude lower in intensity. Ordinary machinery sounds would
not be detectable over more than a few kilometers.

Page IV-B-64

It should be pointed out that the statements made by Geraci and St. Aubin (1979) were made in the absence of information about the effects of oil. Their subsequent research (Geraci and St. Aubin 1982) alleviated many of the earlier concerns.

9-24

Not only did Brownell (1971) find that there was not significant change in the number of beach cast gray whales after the Santa Barbara blowout, but none of the whales showed signs of having been affected by oil.

Page IV-B-69, paragraph 2

It should be mentioned that 'huddling' was reported by Reeves and Ljungblad
9-25 for whales that were not in the presence of seismic activities. (If
'huddling' was a disturbance response, perhaps it was caused by the
presence of the observation aircraft.)

Page IV-B-89, Gear Conflicts

9-26 Rather than speculate on the potential for gear conflicts, the DEIS should note that during the course of tens of thousands of miles of marine seismic data acquisition in Alaskan OCS waters, there has been no significant fishing gear conflicts. To further ensure that conflicts are avoided, the Oil/Fisheries Group of Alaska initiated a voluntary program in 1983 which is described in "A Manual of Geophysical Operations in Fishing Areas of Alaska." If and when development activities occur in the Bering Seas, the Oil/Fisheries Group will be available to provide the necessary communications to avoid or mitigate potential oil industry-fishing industry conflicts.

Page IV-B-97, paragraphs 2 and 4

9-27 Here and elsewhere in the DEIS, MODERATE or MINOR impacts on the commercial fishing industry are projected in the vicinity of Port Moller in the event of a major spill. These conclusions have not been supported by any analysis and may in part be based upon unrealistic development assumptions (i.e. a circuitous marine pipeline route through the entire length of Port Moller and Herendeen Bay). The probability of a major spill at the location and time hypothesised should be noted. The DEIS, which assumes that all applicable laws and regulations are in effect, should note that in the event of a major spill that causes adverse economic effects on commercial fishing there are Federal compensation programs in addition to civil liability mechanisms to mitigate any adverse impacts. As such, even though there could be localized short-term adverse effects on commercial fishing in the remote event of a major spill, such impacts would be mitigated in the medium-term.

Page IV-F-16, paragraph 2

9-28 The designation of preferred transportation corridors on the basis of reconnaissance level data evaluation does not provide the necessary flexibility to ensure the most technically, economically, and environmentally preferable pipeline route in the event that an overland pipeline/onshore terminal is deemed the most feasible development option. It is pure speculation, therefore, to project a MAJOR effect on wilderness values at this time.

Page IV-F-21, paragraph 5

9-29 This is an unwarranted conclusion that assumes oil industry non-compliance with land use planning and other environmental protection laws and regulations. It is the the Bristol Bay State Plan that is the architect of predesignated pipeline corridors and it is MMS in this DEIS that incorporates its use as a development scenario. The very purpose of these planning efforts is to ensure that failure "... to conform with social and economic facility siting policies ..." does not occur.

Page IV-F-23, paragraph 3

9-30 At present there is no approved coastal management program for the area considered in this DEIS to project "MODERATE conflicts with coastal management policies." Such policies, when they are finalized by the district and approved the Alaska Coastal Policy Council and NOAA, should include provision for energy facilities which are "Uses of State Concern." This statement should be deleted in its entirety.

Page IV-J-1, ff

9-31 The meaning of assumption 1 is not clear. The gray whale population is at a high level currently, higher than ever recorded previously in this century. It may well be at initial (pre-exploitation) numbers, and it continues to grow at about 2.4% per year, even with a harvest (authorized by the International Whaling Commission) by the Soviets of 169 gray whales per year. It is absolutely clear that the gray whale population is currently well above the lowest numerical level that it reached historically. Is it intended that the EIS assume that some unidentified catastrophe, in addition to the oil spill, take the gray whale to some small percentage of its current numbers?

9-32 Even though marine seismic operations have not been shown to cause a response of gray whales except at very close range and very high intensities, it is certain that if there were a serious oil spill, seismic surveys near gray whales would be halted, if not by the operator, then by NMFS and MMS.

9-33 No doubt oil will kill <u>some</u> gray whale prey organisms, but it would be impossible to kill a large number except in particular locations. It would be quite impossible to seriously deplete gray whale food resources with a large-scale oilspill in the Sale 92 area. This is particularly true since the main feeding ground lies several hundreds of miles to the north in the northern Bering and southern Chukchi seas; only a very small number of gray whales remain in the southern Bering during summer.

9-34 With respect to potential noise disturbance, it should be remembered that there are <u>hundreds</u> of fishing vessels now plying the waters in the Sale 92 area. The additional vessels of the oil industry would add incrementally to this, but there would not be a larger change in noise levels.

9-35 Several other assumptions listed, such as damage to skin and starvation leading to infertility, are unreasonable. Even with prolonged, continuous contact (75 min.) Geraci and St. Aubin found only temporary and reversible effects on skin cells. Further, the notion that the major feeding area hundreds of miles removed from the Sale 92 area could be affected and that the reproduction of the population could be so adversely changed as to result in complete reproductive failure is preposterous.

9-36 With respect to the right whale, the main area used by right whales is the Gulf of Alaska which is well outside the Sale 92 area, according to the data presented by Townsend (1935). Assuming that the whaling records used by Townsend reflect reasonably the distribution of right whales, the largest number present in the North Pacific region would be in the Gulf of Alaska and therefore not vulnerable to Sale 92 activities.

9-37 Overall, the speculative and exaggerated analyses are grossly misleading. While it is appropriate to take a very conservative approach in a worst-case analysis, the coincidence of so many exceedingly remote events (one of which assumes the absence of prudent regulatory intervention) linked by tenuous logic, is completely unrealistic in even a worst case context.

Response 9-1

This concern is addressed in Response 8-23. In addition, regarding the schedule for platforms, the MMS is refining its basis for predicting exploration and development activity and will henceforth show a platform-construction year as that year in which the platform skirt or the offshore-loading facility is set and affixed to the seafloor.

Response 9-2

Based on the report ("Evaluation of Bering Sea Crude Oil Transportation Systems") by Han Padron Associates, the text has been amended to include an analysis of the potential oil-spill risks and environmental effects of offshore loading (Sec. IV.B.2. of the FEIS).

Response 9-3

This concern is addressed in Response 8-5.

Response 9-4

Further discussion of oil-spill-response capabilities in the open ocean has been added to Section IV.A.4.

Response 9-5

The text (Sec. IV.B.1.a.(1) of the FEIS) has been amended to incorporate additional information regarding the effects of oil and gas development on fisheries in other areas; however, the MMS does not agree that all aspects of the fishing industry elsewhere transfer to the Bering Sea region and its diverse environmental conditions.

Increased safety for the fishing industry as a result of offshore development is indeed a significant positive factor, in view of the hazards associated with commercial fishing in the eastern Bering Sea. Conversely, fishing vessels would be able to assist the oil industry when operational emergencies occurred.

The Information to Lessees (ITL) on Potential Gear Conflict with Commercial Fishing Industry has been amended to include the following statement: "The Minerals Management Service encourages the lessees to use the Oil/Fisheries Group of Alaska to reduce potential conflicts between the oil and commercial fishing industries."

Response 9-6

The worst-case analysis on gray and right whales (Sec. IV.J.) has been amended to present a more realistic portrayal of potential effects.

Response 9-7

This concern is addressed in Responses 4-14, 8-6, and 9-2.

Response 9-8

The ITL on Potential Gear Conflict with Commercial Fishing Industry has been amended to indicate that the MMS encourages the lessee to utilize the Oil/Fisheries Group of Alaska in reducing potential conflicts between the oil and commercial fishing industries.

Response 9-9

The text (Sec. IV.A.1.b. of the FEIS) has been amended to indicate the difference between regional seismic surveys conducted before a sale and site-specific geohazard surveys conducted at drill sites.

Response 9-10

The potential pipeline route outlined in Figure II-2 was identified in the Bristol Bay Area Plan for State Lands (State of Alaska, 1984), the Bristol Bay Regional Management Plan (BBRMP, 1985), and the Draft Alaska National Wildlife Refuge Comprehensive Conservation Plan (USDOI, FWS, 1984). The pipeline route follows general transportation corridors identified in state and federal land-use plans and was used for analysis purposes only. It is not the MMS's intention to identify final locations of facilities or pipelines. If economic reserves of hydrocrabons were discovered and pipelines were determined to be economically and environmentally advantageous, it would be industry's responsibility to work with federal agencies, state and local governments, and private landholders to route pipelines.

Response 9-11

Yoshioka et al. (1985) define large spills as those over 100 gallons (2.38 barrels). The MMS considers large spills to be those of at least 1,000 barrels. Therefore, the MMS does not agree with Sohio that 2.38 barrels is a large spill.

Response 9-12

This concern is addressed in Response 8-39.

Response 9-13

The attribution of a decreasing trend in spillage in the 2.38-barrel-plus category to technological advances and spill-prevention programs was assumed, not statistically demonstrated, by Yoshioka et al. (1985). Lanfear and Amstutz (1983) did not cite the same reasons but, on the contrary, stated that "the statistics do not explain why this drop [in spill occurrence from platforms and tankers] occurred." Lanfear and Amstutz, when associated with the OCS program, reviewed MMS EIS's and consistently insisted that any such inferences to cause and effect be removed from the text.

The usual assumption made when a presumed relationship cannot be statistically demonstrated is that no such relationship exists.

Response 9-14

The text (Sec. IV.A.3. of the FEIS) has been amended to include the suggested information.

Response 9-15

The logic regarding which Prudhoe Bay spills should be considered relevant to the Alaska OCS Region EIS's was developed by consensus with industry representatives, in conjunction with a meeting held at the request of industry on July 30, 1981. Representatives from Marathon Oil, Shell Oil Company, Arco, ABSORB, and the State of Alaska Oil and Gas Conservation Commission attended (also see Response 8-40).

The tanker spill referenced by the commentor was of Prudhoe Bay crude and was spilled by a U.S.-flag tanker carrying Prudhoe Bay crude to market (also see Response 8-39). The commentor's philosophical disagreement with the inclusion of this spill in the spill record is a disagreement with the National Environmental Policy Act (NEPA), not with this EIS. Although the commentor does not agree with the concept of ". . .cradle to grave responsibility for oil production fields, this, in fact, is the responsibility that the NEPA places on the Department of the Interior to evaluate the environmental effects of OCS oil and gas lease sales.

Response 9-16

The spills listed in Table IV-7 were compiled by the Alaska OCS Region from several sources. Documentation was obtained from Blair Wondzell (State of Alaska Oil and Gas Commission) for 2 pre-1974 tanker spills and 1 pipeline spill in Cook Inlet, which were included in the Alaska Oil and Gas Commission (1981) summary of Cook Inlet statistics, but which were not clearly identified in that summary as being spills of over 1,000 barrels. Two Cook Inlet pipeline spills of at least 1,000 barrels are listed in a spill summary by Gulf Research and Development Company (1982). The EIS has assumed that 1 of these latter 2 spills was the spill included in the Alaska Oil and Gas Commission analysis. Documentation for major spills related to the Prudhoe Bay/Kuparuk complex was provided by Von Chong et al. (1983) for 1 tanker spill; by Gilbreath (1969, 1970) for 2 early Prudhoe Bay Field-area spills;

and by an Alaska Department of Environmental Conservation official at Prudhoe Bay for the 1983 airfield spill. The 6 pipeline spills associated with the Prudhoe Bay/Kuparuk development were taken from the Trans-Alaska Pipeline System construction records and from spill records maintained by the BLM Office of Special Projects (the federal government agency with primary regulatory authority over the pipeline). The commentor and other interested parties are directed to the referenced organizations and documents for additional information on these spills.

The institutional memory of industry and government concerning the past history of spills in Alaska and Alaskan waters in the 1960's and early 1970's is poor. The MMS has added 1 to 2 older, historic spills each year to the EIS discussions of the Alaskan spill record. Some spills in Alaska or offshore of Alaska apparently have finally been incorporated into the Alaskan-spill-data base as many as 13 years after an occurrence.

The rationale for the platform-spill statistics attributed to the Prudhoe Bay/Kuparuk complex is discussed in Response 8-40.

Alaska tanker-spill statistics are discussed in Response 8-39. The commentor should be aware that the statistics of Alyeska Pipeline Service Company are for the Port of Valdez and do not include statistics for spills of either Prudhoe Bay or Cook Inlet crude away from that port.

Response 9-17

The cumulative oil-spill-risk analysis is figured over the life of all fields. The commentor's premise that projected spillage is affected by the individual annual rates of production and/or the timeframe of production years is in error. Projected spillage is based solely on the total estimated resource produced or transported.

Response 9-18

This concern is addressed in Response 8-45.

Response 9-19

The text (Sec. IV.A.4.a. of the FEIS) has been amended to include this information.

Response 9-20

This concern is addressed in Response 1-21.

Response 9-21

Section IV.B.1.a.(3) of the FEIS has been amended to reflect this concern. However, in response to the comment that vessel traffic is the most common and widespread noise source from offshore petroleum operations, aircraft noise and visual presence probably are the most harmful sources of disturbance to marine mammals such as sea lions and harbor seals, particularly during the pupping season.

Response 9-22

The estimated 10- to 20-percent reduction in harbor seal pups due to aircraft disturbance may be somewhat high. The estimate refers to a study done by Johnson (1977) on aircraft disturbance of harbor seals on Tugidak Island. His findings suggest that low-flying aircraft may have accounted for the deaths of more than 10 percent of the pups born on Tugidak Island. The text (Sec. IV.B.1.a.(3) of the FEIS) has been amended to read ". . . 10 percent or more . . ." (as cited by Johnson).

Response 9-23

The following excerpts from Gales (1982) are applicable:

> ". . . that ranges of audibility by marine animals of sounds of oil platforms may range from a theoretical high of over 2000 miles to a low of 15 yards, depending on the factors affecting sound detection and propagation. Although slight interference (masking of wanted sounds) may be possible out to a range of 350 miles under extreme conditions, it is much more likely to expect the range of effect to be less than 4 miles, even for a platform. Calculations of detectability of platform noise using the source-path-receiver model indicate that mysticete whales may detect the low frequency line components out to ranges of the order of hundreds of miles under conditions of low ambient noise and excellent sound propagation."

In the text, the statement from Gales (1982) uses a conservative maximum range of 185 kilometers for possible detection of platform noise by whales.

Response 9-24

The text (Sec. IV.B.1.a.(4) of the FEIS) has been clarified to reflect this concern.

Response 9-25

As stated in Fraker (1984, p. 47) "Reeves et al. did record an unusual behavior, which they termed 'huddling,' in the presence of seismic sounds." Further review of Reeves et al. (1983) gives details regarding the frequency of seismic sounds recorded at the whales' location when the "huddling" occurred.

Response 9-26

The potential for fishing-gear loss as a result of seismic-survey vessels operating in fishing areas of the eastern Bering Sea was identified as an issue during the scoping process for this proposed lease sale; therefore, the potential loss of gear requires analysis. Section IV.B.1.b.(1) of the FEIS contains additional information regarding the effects of marine seismic surveys on commercial fishing.

Response 9-27

This analysis is not based on a "circuitous marine pipeline route through the entire length of Port Moller and Herendeen Bay." Rather, it analyzes the potential effects of the most direct routing of the pipeline through this area on the commercial fishing industry. This routing is subject to change as field data are collected and analyzed during the design phase. This statement, however, has been amended to clarify the analysis (Sec. IV.B.1.b.(1) of the FEIS).

Section IV.B.1.b.(1) of the FEIS discusses the compensation process for economic loss to the commercial fishery attributable to OCS oil and gas activities.

Response 9-28

The Port Moller/Balboa Bay pipeline route was selected for analysis in the EIS because it was identified as a transportation corridor in the Bristol Bay Area Plan for State Lands (State of Alaska, 1984), the Bristol Bay Regional Management Plan (BBRMP, 1985), and the Draft Alaska Peninsula National Wildlife Refuge Comprehensive Conservation Plan (USDOI, FWS, 1984). The pipeline route follows general transportation corridors identified in state and federal land-use plans and was used for analysis purposes only. It is not the MMS's intention to identify final locations of facilities or pipelines. If economic reserves of hydrocarbons were discovered and pipelines were determined to be economically and environmentally advantageous, it would be industry's responsibility to work with federal agencies, state and local governments, and private landholders to route pipelines. Because the Port Moller/-Balboa Bay transportation corridor was analyzed, it is not pure speculation to project a major effect on wilderness resources.

If development occurred as indicated in Section IV.A.1., major effects on wilderness values would occur (as indicated in Sec. IV.F.5.a.).

Response 9-29

The text (Sec. IV.F.5.b. of the FEIS) has been clarified to indicate that there are conflicting policies that could affect the location of the pipeline; the hypothetical corrider used in this EIS would be consistent with the Bristol Bay Area Plan for State Lands wilderness area.

Response 9-30

The entire coast of Alaska is subject to the federally approved policies of the Alaska Coastal Management Program. These policies provide the basis for analysis in this EIS; and the analysis conclusions are based on these statewide policies. District policies, when approved, will supplement those of the state or, in some instances, replace them (see USDOI, MMS, McCrea, 1983).

Response 9-31

Assumption No. 1 has been amended (Sec. IV.J. of the FEIS).

Response 9-32

The worst-case scenario indicates that oil-spill and seismic-survey activities would interact with gray whales at different times of the year (early April- mid-July and September-December, respectively), not concurrently. However, in the highly remote possibility that an oil spill occurred during the time when seismic-survey activities occurred, the MMS Regional Supervisor, Field Operations (RSFO), has indicated that, if necessary, shutdown procedures would be decided on a case-by-case basis. The RSFO also indicated that seismic operations would not occur in the vicinity of an oil spill.

Response 9-33

The worst-case analysis states that a 100-day oil spill would deplete the prey in the Port Moller/Nelson Lagoon area, not in the entire Sale 92 lease area, as indicated by the commentor. In laboratory and field experiments, amphipods avoided recolonizing oil-contaminated areas. The LC_{50} for Cragon alaskensis ranged from 0.83 to 0.91 milligrams/liter. A study of Prudhoe Bay crude oil in nearshore sediments found that oil in arctic sediments formed discrete patches of concentrated oil that degraded very slowly (biodegradation was not evident until the end of the first year). A biotic weathering of the oil was slow, with a limited loss, after

2 years exposure, of low-weight aromatic hydrocarbons. It was determined that hydrocarbons in oiled arctic sediments persist in a relatively unaltered state for several years. It also has been demonstrated that oil in sufficient concentration has deleterious effects on benthic communities. Massive kills of benthic fauna can occur when sufficient quantities of oil reach the bottom; and lower oil concentrations can change the structure of the benthic community.

Oiled sediments do not necessarily stay in one place, but rather may be transported elsewhere. Oil can persist in the sediment in anoxic conditions for 6 to 12 years following a spill. In the North Sea, depressed species' diversity and density was evident within a 5-kilometer radius of a storage platform. Following the Amoco Cadiz spill, oil concentrations of up to 100 micrograms/liter were found at depths of 100 meters. Of the total oil spilled, 8 percent (18,000 tons) was deposited in the sediments. In other laboratory experiments, oil was found to be mixed to a depth of 5 centimeters by physical and biological processes. The North Aleutian Shelf Synthesis Report (Thorsteinson, 1984) indicated that the amount of oil in the sediment after a spill can range from 1 to 100 percent.

Response 9-34

A review of Section III.C.1. indicates that there are not "hundreds of vessels now plying the waters in the Sale 92 area." Only 5 percent of the groundfishery fleet occurs in the North Aleutian Basin lease sale area--within 60 miles of the St. George Basin. Salmon fishing generally occurs north of the lease sale area; and halibut fishing is closed in the sale area. The king crab fishery occurs only in the fall; the tanner crab fishery occurs in the spring; and some herring is taken in the spring. The additional vessels of the oil industry that would regularly travel to and from the Sale 92 lease area could result in a greater increase in noise levels than would occur without the lease sale.

Response 9-35

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Response 9-36

The worst-case analysis states, "In the very rare occurrence, one-ninth of the population (22 whales) may be summering in the lease area."

Response 9-37

In preparing an EIS, a federal agency necessarily engages in some degree of forecasting when it defines and evaluates an action's environmental effects. Science is not composed exclusively of cause-and-effect relationships in which perfect predictablity is just a matter of quantitatively describing all variables. Consequently, in preparing an EIS an agency takes all available information about the action, makes tentative assumptions from it, and then predicts an action's effects on the environment. Although the concern expressed by the commentor is salient, it is difficult to assess in its entirety. According to the Council on Environmental Quality, when an agency is confronted with uncertainty about the full extent of an action's environmental effects, it must present to the full extent possible the spectrum of consequences that may result; in other words, all possible environmental consequences must be considered by an agency.

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Dana B. Grannell
South Alaska Regional Manager

10

RECEIVED
MAR 15 1985
REGIONAL DIRECTOR, ALASKA OCS
Minerals Management Service
ANCHORAGE, ALASKA

March 13, 1985

Mr. Al Powers
Regional Manager
Minerals Management Service
P.O. Box 101159
Anchorage, AK 99510

Dear Mr. Powers,

Re: North Aleutian Basin Sale 92 - Draft Environmental Impact Statement

ARCO Alaska, Inc. has reviewed the above referenced document and has the following commentary for your review and consideration.

We recommend proceeding, as scheduled, with the proposed action (Alternative I) to offer for lease all blocks included in the EIS for the North Aleutian Basin Sale 92. We also recommend, that due to the remoteness and harsh environment of the area, the lease terms for this sale area have a ten year time limit to adequately allow for the diligent exploration of this area. The Environmental Impact Statement indicates that several alternatives are available; those being, cancellation (Alternative II) delay (Alternative III) or deferral (Alternative IV). We feel that holding the sale as proposed in Alternative I is justified, due to the limited risks of any significant environmental impact identified in the proposed action.

10-1 Further, we feel the EIS should not appear to favor a particular design or system alternative. Practical, economical and environmental considerations should prevail when it comes to designing systems such as those discussed in the EIS. This EIS seemed to indicate, and emphasize, that the crude oil onshore loading transport system alternative was the system of choice. However, we feel that this system is only one of several transport alternatives, and the crude oil transportation requirements should be evaluated based on their own environmental and economic merit.

10-1a Finally, by using conditional and final probabilities in oil spill risks analysis, the reader is led to believe the high projections for oil spill impact will happen within given target areas.

We feel these comments should be reviewed and considered carefully by the MMS in their final EIS preparation.

ARCO Alaska, Inc supports the oral and written testimony that was presented and submitted by the Alaska Oil and Gas Association. If you require any further information or explanation, please feel free to contact me.

Yours very truly,

D. B. Grannell
Acting Executive Vice President

DBG/icc

L1 3/13/85

Response 10-1

This EIS does not favor any particular design or system alternative. Section II.B. of the EIS indicates that many development and transportation scenarios are possible; for the purpose of analysis in this EIS, pipelines and offshore loading were selected as representative transportation scenarios for Alternative I.

Response 10-1a

The major underlying assumption of the EIS is that the mean resource will be found and produced. The oil-spill probabilities and the expected number of spills upon which the probabilities are based are the best estimate by MMS of what would occur under the proposal, alternatives, and cumulative case. The probabilities give the likelihood of habitat contact only; estimates of the effects of oil spills on biota are made by EIS analysts, not by the oil-spill-risk analysis in Section IV.A.1.

(11)

RECEIVED Anchorage District
Production Exploration United States

MAR 12 1985

REGIONAL DIRECTOR, ALASKA OCS
Minerals Management Service
ANCHORAGE, ALASKA

Marathon Oil Company

P.O. Box 102380
Anchorage, Alaska 99510
Telephone 907/561-5311

March 12, 1985

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MAR 1? 1985

Chief, Office of Program Services
Minerals Management Service
Anchorage, Alaska

Regional Director, Alaska Region
Minerals Management Service
P. O. Box 101159
Anchorage, AK 99510-1159

Re: Comments on DEIS for OCS Sale #92
North Aleutian Basin, Alaska

Gentlemen:

Marathon Oil Company appreciates the opportunity to submit comments on the DEIS for OCS Sale #92, North Aleutian Basin. As a member of the Alaska Oil and Gas Association, Marathon supports that organization's testimony and written comments on the DEIS.

Marathon supports the Alternative I - Proposal, which will best allow increased opportunities to explore and develop oil and gas reserves in the area.

The history of delay and inactivity in regard to oil and gas lease sales in the North Aleutian Basin is well documented. Alternatives II and III would continue the illogical attitude that safe oil and gas development cannot be conducted in a proper manner. This attitude is not only false but dangerous to the country's well being, as imported oil continues to contribute a large share of the United States needs.

The oil and gas industry has successfully proven that the exploration and development of oil and gas can take place in an environmentally sound manner and can harmoniously coexist with other natural resources. While realizing the concerns expressed in Alternative IV for certain blocks within the deferral sale area, such concerns are not a basis for deferrals when proper stipulations and mitigating measures can be adopted to protect multiple use within the area.

Marathon supports a ten-year lease term for the leases accepted in the proposed offering, and believes that due to distance, lead times to development, and the environment, a ten-year term is necessary.

Thank you for your consideration of these comments; please call if additional information is needed.

Very truly yours,

Morris L. Lowman
District Landman

MLL/MMW/pr

xc: Mr. F. G. Nagel
Mr. W. H. Legg

Shell Western E&P Inc.
A Subsidiary of Shell Oil Company

P.O. Box 527
Houston, TX 77001

200 N. Dairy Ashford
Houston, TX 77079

(12)

February 27, 1985

U.S. Dept. of the Interior
Minerals Management Service
ATTN Alaska Regional Director
P. O. Box 101159
Anchorage, AK 99510

Gentlemen:

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT
NORTH ALEUTIAN BASIN SALE NO. 92
ALASKA OCS REGION

We have reviewed the Draft Environmental Impact Statement (DEIS) for North Aleutian Basin Lease Sale No. 92 with special attention given to the proposed action and the alternatives to the proposal for the subject sale.

Shell Western strongly prefers the proposed action (Alternative I) and recommends that the sale be conducted as scheduled with no further tract deletions. Otherwise, there will be a serious negative impact on the timely resource evaluation of a large area with major hydrocarbon potential.

The North Aleutian Basin Planning Area consists of 32.5 million acres. The proposed sale acreage has already been reduced to 5.6 million acres, or approximately 17 percent of the Planning Area. Other alternatives proposed in the DEIS are addressed below:

Alternative II would cancel the proposed lease sale. We see no reason at all to cancel the sale. The levels of effects to biological and socioeconomic systems as a result of Alternative I are indicated in the DEIS to be negligible or minor, except for moderate effect to sea otters and coastal and marine birds. Furthermore, any impact to transportation systems and coastal land use plans, mainly from potential pipeline and terminal development, is similar to the impact considered in previously held St. George OCS 70 and Norton Sound OCS 57 lease sales. These considerations do not justify cancellation of the sale.

Alternative III would delay the sale for a period of five years. We see this as counter productive to the timely evaluation and development of the nation's energy resources. Industry has the technical capability today to explore and develop the area in an environmentally responsible manner.

Alternative IV, which expands to 25 miles the near shore buffer zone, would result in the further deletion of approximately 772,000 acres from the sale area. The benefit claimed in the DEIS would be some reduction of minor to

moderate impact to coastal and marine birds and sea otters. The comparative analysis in the DEIS shows no reduction in potential hydrocarbons as a result of eliminating this acreage. We believe that deletion of the acreage as proposed in Alternative IV could result in a significant reduction in the area's resource potential.

12-1 The oil and gas industry interest in the area's potential is very high. Minerals Management Service's low assessment of the volume potential for the area is inconsistent with a 1984 Department of the Interior analysis of industry ranking of OCS areas. The analysis ranked the North Aleutian Basin second in interest and third in resource potential for all offshore Alaska.

The potential benefits of hydrocarbon exploration and development for this area far outweigh any identified biological and socioeconomic advantages of the various alternatives.

We urge you to proceed with the proposed action (Alternative I) and hold OCS Sale No. 92 as presently scheduled.

Very truly yours,

R L Howard

R. L. Howard
General Manager
Rocky Mountain and Pacific Frontier
Divisions

RLA:SS

Response 12-1

The Draft Proposed 5-Year OCS Oil and Gas Leasing Program (March 1985) shows the industry ranking of the North Aleutian Basin to be third in interest and fourth in resource potential among the Alaska OCS planning areas. The MMS ranks the North Aleutian Basin fifth in unrisked resources for Alaska. Considering the uncertainties, this probably is not a significant difference.

13

Nelson Lagoon Village Council
Nelson Lagoon, via Cold Bay,
Alaska, 99571

March 7, 1985

Mr. Glen Yankus
Regional Supervisor, Leasing & Environment
Minerals Management Service
P.O. Box 101159
Anchorage, Ak., 99508

Dear Mr. Yankus:

The Nelson Lagoon Village Council unanimously supports Governor Sheffield's nine year moratorium regarding the North Aleutian Basin Sale 92. We believe more research is needed in the DEIS. We would like to add that we strongly support the Aleutian East CRSA Board Resolution concerning this sale.

Sincerely,

Paul M. Gundersen

Paul M. Gundersen
President

14

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Washington, D.C. 20230

OFFICE OF THE ADMINISTRATOR

March 29, 1985

Mr. Richard Miller
MMS (644) US-DOI
12203 Sinrise Valley Road
Reston, Virginia 22091

Dear Mr. Miller,

This is in reference to your draft environmental impact statement on OCS Lease Sale 92 in the North Aleutian Basin. Enclosed are technical comments from the National Oceanic and Atmospheric Administration.

We hope our comments will assist you. We look forward to working with your staff in Alaska to resolve the issues raised in our comments prior to completion of the final environmental impact statement. We would appreciate receiving twenty copies of the final environmental impact statement.

Sincerely,

David Cottingham for

Joyce M. Wood
Chief, Ecology and
Conservation Division

Enclosure

DC:lg

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION COMMENTS ON THE ENVIRONMENTAL IMPACT STATEMENT FOR LEASE SALE 92 IN THE NORTH ALEUTIAN BASIN

The National Oceanic and Atmospheric Administration (NOAA) reviewed the draft environmental impact statement (DEIS) for Lease Sale No. 92 in the North Aleutian Basin. Although the major environmental issues surrounding the proposed action in Bristol Bay, Alaska have been described, and several sections are quite well-written and informative, our review has identified several sections in the document that require clarification.

Organization/Style

The document is difficult to review because of its complexity, organization, and hierachial in which the impact analyses are conducted. For example, fisheries impacts (Section IV-B-1-a) contains four separate subsections, four different summaries, and eight different conclusions. This format makes it difficult for the reader to get a clear understanding of the sale related impacts on many economically important species.

Summary documents were often used which resulted in a glossing over of some disciplinary topics where information is not always available. Examples include: the identification of nursery grounds in the nearshore North Aleutian Basin for pollock, cod, and sablefish; information regarding the timing and
14-1 out-migration of juvenile salmonids; and generic effects descriptions about the avoidance of salmonids and herring to spilled oil. Editors of summary documents prepared by Shell Oil (Gusey), SOHIO (Lewbel), NMFS (Morris) and OAD (Hameedi and Thorsteinson) have been improperly cited throughout the DEIS. In many instances, synthesis editors have been credited with original research or undeserved authorship for text contained within the documents written by others.

Editorially, the DEIS provides brief and informative life history information about numerous fishery resources. These species accounts provide an accurate review of the general distribution, reproductive ecology and food habits of each species. The list of species is long and because each account is roughly the same length (number of words), the importance (commercial or ecological values) and vulnerability of major species is obscured. For example, the North Aleutian Basin commercial species of greatest concern and emphasis are: Pacific salmon (five species), red king crab, Tanner crabs, herring, halibut, cod, pollock, and yellowfin and rock soles. Ecologically, rainbow smelt, sandlance, capelin and herring are dominant forage species in Bristol Bay. The abundances and commercial fisheries for Pacific ocean perch, Atka mackerel, sablefish, Greenland turbot, arrowtooth flounder and Korean hair crab lie, for the most part, outside the area of interest. It appears as if a "standard list" of species was included in the DEIS rather than descriptions of those most likely to be affected by the proposed action.

Alternatives

Alternatives 1 and 4 offer the same conditional resource estimate for the respective areas to be leased. Additional clarification is needed on why the probable impacts would be different (reduced) in the Alaska Peninsula Deferral. Apparently, this conclusion is based on the simple removal of
14-2 hypothetical spill launch points from the deferral area and in the spill trajectory analysis. It is not clear why the conditional resource estimate does not change under this proposal nor why there would be an expected difference in number of production platforms than described in Alternative 1. The other two alternatives (2 and 3), no sale and delay the sale, amount to essentially the same thing, since the former is for the present 5-year schedule while the latter is for 5 years.

Oilspill Trajectory Analysis

Offshore oil spills or other discharges are, with few exceptions, described as localized with little impact on regional populations. This conclusion rests entirely on the results of the MMS Oil Spill Risk Analysis (OSRA). That analysis computes the likelihood of spilled oil reaching landfalls/biological resources from 12 hypothetical launch points in the North Aleutian Basin sale area. Oilspill trajectories were simulated under two sets of environmental conditions: presence (fall-spring) and absence (spring-autumn) of ice. The combined probabilities of an oil spill greater than 1000 bbl. have been generated for 3 day (4%), 10 day (10%), and 30 day (24%) periods assuming mean oceanographic and meteorological conditions in conjunction with an expected spill rate. The expected spill rate is obtained from volumetric estimates of the unrisked oil resource and actual spill statistics from other OCS areas. The analysis
14-3 further assumes that if an oil spill did not occur, water column concentrations would not exceed 5ppm. Documentation for these concentrations is not provided.

The oilspill trajectory analysis does not accurately portray the potential for impacts within and immediately adjacent to the lease area. It has very few spill points within the lease area for calculating spill trajectories, and has such a broad area of coverage that local risks (specific targets and probabilities) are obscured. If it is assumed that spilled oil remained offshore, the MMS analysis is probably accurate. However, the transport and fate of oil spilled in nearshore or surf zone areas are going to be different.
14-4 In nearshore areas, hydrocarbon concentrations may be greater and oil may persist longer. Effects would be much more pronounced in organisms and populations encountering such levels of contamination and therefore should not be overlooked in the coastal North Aleutian Basin. Possible levels of contamination and their effects in nearshore waters need further consideration. More documentation is needed regarding the water column concentrations of hydrocarbons presented for hypothetical oil spills. The oil spill analysis should provide quantitative time-dependent distributions of these expected levels of contamination for application in later impact assessments.

A more lease-area specific analysis that takes better account of these local variables should be conducted. This analysis should be revised
14-5 to better define risk to local areas, populations and habitats and to fisheries that are conducted in the area. The trajectories also do not appear to reflect the variability in the winds of the lease area, because the target

probabilities appear to be too consistent and current-driven, whereas most of the lease area responds to wind-driven forces. The transition seasons (spring and fall) appear to be obscured by the choice of only two seasons for the trajectory calculations. As a result, we believe the analyses understate the risks to coastal areas along the Alaska Peninsula.

14-6 Finally, we question the use of ice-cover during the winter season as the lease area remains ice-free in most years. It is incorrect to assume the area is ice-covered from late fall to early spring.

Since many of the assumptions relating to the environmental consequences of the proposal are based on the oilspill risk analysis, we believe that the conclusions of the DEIS cannot be stated with confidence. Also, it would have been useful if at least some of the trajectories were illustrated in the document.

Oilspill Effects

14-7 The conclusions on probable effects of oil spills should also be reassessed. Local stocks and local area impacts are minimized versus regional population and areawide impacts, such that local losses are not considered important. The focus of the DEIS analyses has been skewed toward the general, and discounted for the specific. There are many examples in the DEIS where an oil spill at a particular season or location is acknowledged to produce MAJOR or MODERATE effects, yet the DEIS consistently rates the overall effects as MINOR. These statements are not made through rigorous analysis of stock abundances and distribution patterns, habitat requirements, recovery and recolonization potential, or local significance. The conclusions on impact levels tend to be based on assumptions that the effects have limited ranges and should not affect more than a small portion of the total resource. Therefore, all regional effects are judged to be minor. We believe that this approach consistently under-represents the environmental consequences of the proposal, and that a MAJOR effect in a local area or to a local stock should remain a MAJOR effect if it cannot be demonstrated to also be a transient (less than one generation) effect. Another reason effects are minimized is

14-8 that this section portrays the mean case scenario, rather than the worst-case as represented by the maximum resource scenario. Under the maximum case many of the MINOR impacts become MODERATE or MAJOR. We believe that the worst case scenario deserves better analysis and visability in the DEIS.

An example of this approach is found in the description of risk of oilspill to the Port Moller area. This is an area where potential habitat disruptions from the proposed actions seem likely and environmental risks are high. The DEIS indicates that there is a 20 percent chance of an oilspill greater than 1000 barrels occurring in this area. If this spill did occur the DEIS notes that there is up to a 99.5 percent chance of contact with the near shore areas of Port Moller within 3 days. The subsequent arguments presented in the DEIS of "negligible" or "minor" effects associated with the probability of spilled oil reaching selected landfalls/resources are unconvincing. MMS should evaluate what would happen if oil were actually introduced into these areas. What might the biological losses be and how would they translate to local and regional fisheries? In this manner the spill trajectory analysis could be used in a more supportive role for the discussions pertaining to the small probability of occurrence of such an event. This would not preclude consideration of the environmental consequences of larger spillage that could result in more adverse effects than those contained within the DEIS.

14-9 The analysis should also consider probable changes in the ecosystem resulting from potential acute or chronic oil spills. The impact assessments provided are limited in scope because they are species-specific. Ecological information regarding the North Aleutian Basin is available and should be consulted and integrated.

14-10 Finally, serious, thoughtful, consideration and discussion of clean-up probabilities, costs, mechanisms and results - both as "efficiency of clean-up" and "possible environmental impacts" should be fully documented in the DEIS.

Ongoing and Recent Research Activities

14-11a The MMS has failed to incorporate a significant amount of pertinent information in the DEIS (See Attached List). This is unfortunate because many studies were purposely designed to: a) describe populations at risk, especially salmoid, crustacean, and sea otter resources; b) model the effects of hypothetical oil spills on selected commercial resources; and c) determine the dominant physical and biological factors accounting for the observed high productivity and subsequent use by fish and wildlife in this area.

There are several ongoing studies in Bristol Bay that are providing physical and biological data pertinent to the ecology and fisheries of the region. These are briefly described in an attachment to these comments. Not discussed in this attachment was an ongoing study examining the effects of spilled oil on herring. This two year study is expected to be completed in FY 86. Two other studies, avoidance behavior in salmonids and sublethal effects of hydrocarbons on waterfowl, will be initiated in FY 86. Most likely, this work will extend into FY 87. The MMS is currently funding two studies aimed at describing the sedimentation of oil and its movement along the seafloor as part of their Alaska Studies Program. Algorithms developed under these programs are expected to link with similar models developed for open ocean conditions by the Outer Continental Shelf Environmental Assessment Program (OCSEAP). Models and simulation results will not be available for two or three years.

Beginning in FY 85, the OCSEAP will initiate an ecological survey of the Unimak Pass. As presently envisaged, the study will consist of a literature synthesis in the first year followed by two to three years of data collection and analysis. Aerial surveys for marine mammals will begin this summer and are expected to be funded for at least three years. Another OCSEAP study beginning this year includes an acoustics examination of the effects of OCS-generated noises on the behavior of gray whales. This will have a direct application to gray whales which occur in the Port Moller area and the near-shore North Aleutian Basin.

Continued fish surveys in Bristol Bay are likely to be funded at least through FY 88 because of the need for more and better data on juvenile salmon movements, other forage fish, and larval and juvenile king crab ecology. Given the depressed condition of Bering Sea red king crab, additional studies are warranted. A study to examine the distribution of gravid females has been included in the draft MMS Regional Studies Program for FY 87. Computer modeling of the effects of oil spills on the Bristol Bay sea otters has been recommended for FY 87. OCSEAP has also recommended an ecological survey of the Port Moller region for inclusion in this document.

In the next five years much new information will be obtained regarding the nearshore ecology of Bristol Bay and other regions likely to be affected by planned petroleum activities in the North Aleutian Basin. This coastal environment is where potential impacts to ecosystems and regional populations could be greatest.

Biological Resources.

Given the magnitude in size and worth of regional salmon, crab, herring and developing groundfisheries in Bristol Bay, discussions concerning their biologies and ecologies must reflect the available data. More attention to seasonality and habitat use features is warranted. The attached technical comments to this correspondence will enhance the following discussions as they pertain to specific species or species groupings.

14-11b 1. Salmon. The out-migration of individual salmon species through Bristol Bay has largely been described from past work on sockeye salmon. Most of this sampling was conducted east of Port Moller during June, July and August. Chinook migrate through this region in May and were therefore not sampled. Sampling gears employed were generally not designed to fish shallow waters (less than 15-20 m) and therefore the smaller more coastal chum and pink salmon were not routinely sampled. Few coho were sampled in previous efforts, however their migration corridor is speculated as being similar to that of sockeye salmon. The coho migration occurs later in summer than that of sockeye. The timing of all juvenile salmon migration has been hypothesized from this sockeye work. In general, the order of migration is known by species and can vary annually depending on weather conditions.

Earlier studies suggested an offshore movement of juvenile salmon in the Port Moller region. Plankton samples collected last summer in the waters north of Izembek Lagoon area indicate preferred salmon food items were in abundance. It is therefore quite probable that the juvenile migrations proceed through these waters including the areas planned for leasing. Because salmon stocks from all over Bristol Bay, and possibly elsewhere in the Bering Sea, migrate along this seaward corridor, they are potentially at risk from the proposed action. Stock impacts need to be more fully considered for juveniles and adults in context of possible impacts to regional populations.

14-12 2. Red King Crab. The importance of the North Aleutian Basin to the reproductive ecology of red king crab makes this species one of the most vulnerable to the proposed action. Since significant information obtained by OCSEAP pertinent to the early life stages of this species was not reviewed in the DEIS, complete revisions of relevant sections are necessary. Special attention should focus on location of hatch, distribution and transport of larvae in the areas of larval settlement and juvenile survival, especially in the Port Moller-Cape Seniavin should be described.

14-13 3. Pacific Herring. Herring stocks utilizing Port Moller for spawning and seasonal nursery requirements could be seriously impacted by the planned leasing action and possible pipeline corridor. Stock definition in the Port Moller estuarine complex is non-existent, making any assessment of what oiling losses or spawning habitat disruptions, recovery periods, etc. meaningless at present. Such possible impacts cannot be viewed in light of regional Bristol Bay populations and must focus on Port Moller and the fishery operating there. General information on this population and its spawning habitat is needed prior to any development in this region. Additional consideration of potential effects on fisheries at Togiak and Goodnews Bay should be described.

14-14 4. Other Fish. The seasonality of species use of the North Aleutian Basin should be emphasized. Several forage species are thought to dominate the functioning of the coastal Bristol Bay ecosystem; these include the Pacific sandlance, capeline and rainbow smelt. Discussions of their roles in this ecosystem should be amplified.

14-15 5. Sea Otter. Like the red king crab, this is a species whose population in Bristol Bay could be significantly reduced if oil reached nearshore waters during certain times of the year. The coastal waters adjacent to the proposed lease area seasonally support between 15,000 and 20,000 otters. In contrast to the DEIS, we believe that this area provides high quality habitat for otters even though it does not possess the rocky-kelpy features normally characterizing their environmental associations. The population dynamics and demography for the Bristol Bay population of otters have not been described.

14-16 6. Special habitats. The DEIS does not provide a comprehensive analysis of possible environmental consequences of the proposed action on nearshore habitats and the populations they support. The value of these habitats to various fish, bird and mammal populations should not be de-emphasized because probabilities of their potential disruption under several hypothetical oil development scenarios is low. These areas include Bechevin Bay, Izembek Lagoon, Port Moller-Cape Seniavin, Port Heiden and the inner portion of Bristol Bay. Habitat characterizations should include patterns of seasonal use and vulnerability and include coastal zones in front of the bays and lagoons. South of the Alaska Peninsula similar information is needed for Balboa Bay and coastal waters stretching west to Unimak Pass. In the latter case, possible impacts on the Chignik salmon fishery as well as others south of Unimak Island could be evaluated.

Summary/Recommendation

Substantial information needs must be addressed prepartory to offshore oil and gas development in Bristol Bay. Ongoing and planned studies, funded by NOAA and MMS, will provide additional information about regional ecosystems and impacts to fishieries. Many of the planned studies will focus on topics that have been identified for Bristol Bay throughout the leasing process but have not been funded due to changing lease schedules. Funding levels for OCS-related studies in Alaska will extend the time necessary to complete these studies in the North Aleutian Basin over several years.

In view of these studies, important resource values within or adjacent to the proposed lease area, and taking into consideration all the uncertainties contained in the proposed action, we believe that the document does not adequately address the probable consequences of the proposal. The characterization of the living resources and the analysis of risk to those resources requires revision. We do not believe that the existing DEIS realistically examines the impacts that would affect the fisheries and marine mammal resources within and immediately adjacent to the lease area. It minimizes the potential consequences of the lease sale to the present and future livelihood of the domestic fishing industry in this most important fishing grounds of Alaska.

Our detailed comments follow. We ask that MMS incorporate our comments in the FEIS and continue funding of ongoing and planned studies. We look forward to working with MMS to evaluate impacts of the proposed lease sale on fishing resources.

SECTION BY SECTION COMMENTS

SUMMARY (pp. xviv-xxiv).

14-17a The summary should be revised. Here should be given the summary statements that are found throughout Section IV. Why should Alternative III be considered to have the same level of effects of the proposal (Table S-1)? Would not a delay require a complete re-evaluation and reinitiation of the EIS process and lease sale proposal? Would not all assumptions be reviewed and updated? Would not new information affect the analysis?

14-17b Table S-1: The use of footnotes, i.e. 2 is misleading. It obscures the fact that MODERATE (and MAJOR for king crab) impact is likely "if an oil spill occurred and contacted nearshore areas..."

SECTION I. PURPOSE FOR ACTION (pp. I-A-1 to I-D-7).

14-18 We find the page numbering system extremely cumbersome for providing comments. We recommend that MMS eliminate the subsection letter identifier (i.e. A,B, etc.) and use simple section-page numbers (i.e. I-5 vs. I-B-1). We also believe that pages with figures and tables should be numbered to ease the reviewers comment effort.

14-19 p. I. D.1: The second specific concern listed in this table does not indicate what section of the DEIS to refer to.

14-20 p. I. D.6: We believe the DEIS should assess the effectiveness of oilspill response and cleanup, as it certainly does make assumptions regarding these when it addresses oilspill effects in later sections.

SECTION II. ALTERNATIVES INCLUDING THE PROPOSED ACTION (pp. II-A-1 to II. D.9.

14-21 Here we find that the action alternatives, although seemingly four, are in reality only two. Alternatives I and III have the same resource estimate; Alternatives II and III both are only temporary (up to five year) delays. We believe that MMS should have offered an alternative that reduced the size of the offering, the level of activity and resource estimates, and provided lowered environmental risks as a part of the EIS analysis.

14-22a The EIS identifies "potential" mitigating measures but says that they are part of the proposed action. Can that be assumed? The EIS should identify other measures that are not part of the proposal, but could be taken that would further reduce the environmental consequences of the action. For example, a potential stipulation that would limit geophysical seismic surveys to the winter months and may reduce impacts to gray whales and right whales could be proposed and analyzed as an alternative. The DEIS does not offer options for improving mitigation of impacts, other than under the proposal or by the choice of alternatives. We believe that such options could ameliorate some unresolved concerns that are inherent in the proposal.

14-22b p. II. C.1: One offshore platform seems very low for the production of the mean resource, and certainly is not consistent with the geology of the lease area which probably is composed of many small structures rather than one large oil reservoir. We are concerned that this estimate is unreliable, and could severely underestimate the impacts if considerably higher numbers of rigs and platforms were required to explore or extract the oil.

14-23 p. II. C.7: Certainly Unimak Pass should also be considered as an "Area of Special Biological Sensitivity".

14-24 p. II. C.14: The statements that the ITL on Bird and Mammal Protection has "only a minor overall benefit" to local cetacean populations should be reexamined. If there is little benefit then perhaps something more stringent should be designed to protect endangered whales and other marine mammals, or the conclusions about the consequences of the proposal should more clearly reflect the lack of protection afforded by this proposed mitigating measure.

14-25a p. II. D.2 to II. D.8: We certainly fail to see how the EIS can find any differences in the "Comparative Analysis of Alternatives I and IV" such as are stated in Table II-2, without the projected resource estimates and scenarios being different between the two.

14-25b Table II.2: No mention is made this time of the impact "if an oil spill occurred and contacted nearshore areas...." This seems to ignore the facts presented in Table S-1. Further it is not stressed that Alternative IV does not reduce the conditional resource estimate at all. A final note,

14-26 Pacific walrus do not breed on Amak Island.

Section III. DESCRIPTION OF THE AFFECTED ENVIRONMENT (pp. III. A.1 to III. D.16)

14-27a We believe this section provides oversimplified information on the oceanography and meteorology of the lease area by not considering the variability in wind patterns, local currents, and seasonal ice cover. The data presented for the southern Bering Sea region, overall has only limited usefulness for lease area prediction.

14-27b The subsections on fishery resources, marine mammals, and commercial fisheries are relatively accurate but general. Site specific information that can later be used in predicting environmental consequences is sorely lacking and inadequate. The location of specific resources in the lease area is poorly known and not well presented in the DEIS. Most distribution maps cover such large areas that lease area distribution or occurrence cannot be identified or described with any reasonable certainty. This weakens the consequent assessment of impacts. The resource and habitat descriptions are generally lacking in attention to the southside of the Peninsula (i.e. Balboa Bay and the proposed tanker route) where some of the potential impacts can be expected. Little attention is given to

ecosystem and habitat linkages that could affect specific resources, food web interactions, or abiotic-biotic processes that underlay the productivity and resource values of the region. Critical habitats are inconsistently identified for the various resources.

14-28a p. III. A.2: Earthquake hazards certainly deserve more detailed discussion than that given here, especially because of the Shumagin Gap hypothesis and it implications for both oilspill risk and human safety.

14-28b p. III A.4: No mention is made of the fact that the gaps across the Alaska Peninsula, e.g. Cold Bay and Port Moller, Greatly perturb large scale winds. Schumacher and Moen (see Schumacher, J.D. and P.D. Moen. 1983. Circulation and hydrography of Unimak Pass and the shelf waters north of the Alaska Peninsula NOAA Tech. Memo ERL PMEL-47. 75 pp.) clearly note this affect, in particular for Port Moller where the transpeninsular pipeline begins. Have such critical local effects been accounted for in oil-trajectory analysis?

14-28c p. III A.4: Last line: The inner front is 10 km wide, not 50 km.

14-28d p. III A.S: line 5: Schumacher et. al.(See Schumacher, J.D., T.H. Kinder and L.K. Coachman. 1983. Eastern Bering Sea. Reviews of Geophys. and Space Phys., 21, 1149-1153.) note that vertically mixed conditions do not exist in the regions of direct influence of freshwater discharge (you don't need a gaged river for runoff to be critical e.g. the Kenai Current), and Schumacher and Moen (1983) clearly show stratification in the vicinity of Port Moller.

14-28e p. III A.5: 3rd para: Schumacher and Kinder(See Schumacher, J.D. and T.H. Kinder. 1983. Low frequency currents over the Bering Sea Shelf. J. Phys. Oceanogr., 13 607-623.) should also be referenced. It is based on more data than Kinder and Schumacher (1981).

14-28f p. III A.5: 3rd para: Schumacher and Kinder (1983) state that winter flow along the Peninsular is substantially greater.

14-28g P. III A.5: 4th para: Again Schumacher and Kinder (1983) have used more extensive data sets. The new percentages of total energy in the inner and middle shelf regimes is 94 and 92 respectively. Where did 20% to 40% come from? Wind driven reversals, where? The citation for Schumacher (1981a) was a DRAFT report for the outer shelf domain, not for the coastal region in this report.

14-28h p. III A.5: 6th para: Both Overland and Pease (1981) and Niebauer (1981) agree that upper air (700mb) steerage of storms regualates ice extent. Of course, as Niebauer notes, SST follows the year-to-year variation in storm tracks. There are not two hypotheses.

14-28i p. III A.5: 7th para: This sentence is not true and is not found in Overland and Pease(1981). The ice limit is a balance between ice advection (by winds) and heat content in the upper ocean.

14-28j p. III A.6: 1st para: What is the reference for ice 2 to 4 m thick?

14-28k p. III A.6: 1st para: last sentence: This is but one of many hypotheses for the acceleration of ice bands in the Marginal Ice Zone (see, Wadham, 1983 JGR, Vol. 88, March 20).

14-28l p. III A.6: 2nd para: Should reference Pearson, Mofjeld and Tripp (1981 Bering Sea Book, Vol. 1)?

14-29 p. III B.2: Need citation for "Bristol Bay sockeye runs peak every five years".

14-30 p. III B.3: Sockeye salmon food is suspected of being more abundant once the smolts move into the Port Heiden area. For most species it must be remembered that their food habits are not static; they change with time, area and age of fish.

14-31a p. III B.3: Few juvenile chinook have been captured in Bristol Bay because no sampling has been conducted during periods of assumed peak abundance (late April-May).

14-31b p. III B.4: In paragraph 4 two bands of migrating fish are mentioned but the destination of only one band is described.

14-31c p. III B. 8: The North Aleutian Basin lease area is one of the major areas of distribution for the pollock eggs and larvae (see Waldron 1981 in the bibliography) whereas juvenile age 1 and 2 pollock are mainly located north of the Pribilof Islands. Thus the number of eggs and larvae would far exceed numbers of juveniles in the lease area.

14-31d p. III B. 8. para 3: It is more accurate to say that spawning occurs from off the shelf edge into about 90 meters. The spawning period starts in February.

14-31e p. III B. 8. para 4: This paragraph should be revised to read that juveniles occupy near bottom and mid water layers. Juveniles(assuming this means pollock that have descended from surface waters) are not concentrated in nearshore waters but are found broadly distributed over the shelf and at ages 1 and 2 are mainly distributed north of the Pribilof Islands.

14-32 p. III. B.7 ff: Locations of concentration areas of the various groundfish species are not identified in the DEIS and should be protrayed. Newer information is available on species biomasses than presented in the subsection.

14-33 III.B.7: Citing the NAS synthesis report as a primary reference on capelin and eulachon suggests more is known about this species in Bristol Bay than really is.

14-34 III.B.9: What are sand eels?

14-35 III.B.9-10: The NAB is not an area of great importance to rockfish, Atka mackerel or sablefish. The relative importance of the area to such species inside 50 m will be part of the results of ongoing OCSEAP studies RU's 658 and 659.

14-36a p. III B.10: Very little is known about the Pacific sandlance in Bristol Bay. Its tremendous abundance there suggests its importance not only as forage but to the functioning of this ecosystem.

14-36b p. III B. 10 para 4: Sablefish are usually only abundant on the slope in the Bering Sea. Juvenile sablefish are occasionally abundant on the shelf in the North Aleutian Basin.

14-36c p. III B. 11 para 3: Yellowfin sole are rarely found on the slope. Dense concentrations near Unimak Island are the exception rather than the rule. They are normally concentrated in the inner and mid-shelf waters.

14-37 p. III.B.11-12: Yellowfin sole are currently underharvested in Bristol Bay. Average fecundity of this species is approximately 800,000 eggs.

14-38 p. III.B.12: It has only been hypothesized that the nearshore NAB provides an important nursery ground for yellowfin sole.

14-39 p. III B 14: NMFS surveys that have covered most of the range of this species in the Bering Sea haven't produced biomass estimates less than 127,000 t.

14-40 p. III.B.16: More recent information should be incorporated into the species account of red king relative to the NAB (final reports for RU's 609, 639). Factors influencing the cyclic abundance should also include disease, especially during the reproductive periods or in other age stages where crabs may be aggregating. The 1983 NMFS surveys indicate there should be concern that the red king crab population may have reached critically low points in terms of reduced copulation throughout the population. It has also been hypothesized that there has been a shift in the distribution of mature females in Bristol Bay and this shift may affect year class success by the eventual transport of pelagic larvae away from benthic refuge habitats where juvenile settle. These habitats are suggested as being areas where juvenile survival is greatest. Refuge habitats have been identified in the Port Moller - C. Seniaven area and farther in Bristol Bay.

It cannot be emphasized enough how important the North Aleutian Basin is to the reproduction of this species. Larvae, believed to be very sensitive to spilled oil and its derivatives, are hatched in nearshore areas. Larvae are abundant between Amak Island and Port Heiden within a fairly narrow band (40-70m depth range) throughout most of the summer. The pelagic stage lasts up to 4 months (not 2 as indicated in the DEIS). Preliminary results of an OCSEAP-sponsored ecosystem study in the Izembek Lagoon-to-Port Moller region during 1984 found tremendous numbers of jellyfish in the pelagic environment. It has been hypothesized that they may be competing with the crab (and other larvae) for food or preying directly upon them. No podding of crabs younger than age 3 has been observed in the NAB. Age 3-5 year crabs appear to form pods in the Port Moller area (40-60m depth). All indications are that the waters in front and to the east of Port Moller are extremely important to this species.

14-41 p. III. B.16: There is an inconsistency here between the statements on the dominance of echinoderms or king crabs in the benthic environment that should be corrected.

14-42 p. III. B.17: Chionoecetes is consistently misspelled throughout the document.

14-43 III B.18: Dungeness crabs appear only to be found nearshore in the more rocky substrate habitat present north of Unimak Island.

14-44 III.B.19-21: This information on marine and coastal birds doesn't seem very specific to the NAB.

14-45 III.B.23: The section on critical habitats is under-emphasized especially considering the importance of lagoons and bays to waterfowl and shorebirds, and the nearshore to overwintering species of seabirds.

14-46 III.B.24: Sea otter section does not include the recent 1981 survey information, conducted by OCSEAP RU 623 (PI-Cimberg). During summer, the sea otters, mainly males form rafts numbering in the hundreds (one raft of approximately 700 animals was reported in front of Izembek Lagoon in June 1981). This work, like Schneider's, studied the summer movements, inshore-offshore patterns of abundance and provided some information about the food habits of this species.

14-47 III.B.27: See Fay's recent final report (RU 611). The pressure on the food resource is also coming from other benthic feeding species. Mating is believed to take place in the water near the ice, not on the ice.

14-48 p. III. B.28: It should be mentioned here that right whales are plankton-feeding baleen whales.

14-49 p. III. B.31: What is meant by a "subsiding" summer population?

14-50 p. III. C.1: Groundfish fisheries do take place year round.

14-51 p. III. C.4: Salmon runs and spawning streams on the Peninsula should be shown and their fishing areas identified.

14-52 p. III. C.18: The statement of what the "flatfish" category includes is in error from the mention of perch onward.

14-53 p. IV. A.1: Here it says there will be 5 exploration wells; Table IV-1 says 8.

14-54 Table IV. A.1: How can the expected number of oilspills be different for Alternatives I and IV when the resource estimates are the same?

p. IV.A.9: Good comparison of numbers of expected and observed spills in Cook Inlet and Prudhoe Bay.

14-55 p. IV.A.10: The oil spill trajectory simulations heading should indicate this is subpart C of the chapter.

14-56 p. IV.A.13: Change "aging" to "partioning". "Aging" could occur in a sealed barrel and have no affect on fate. It's next to impossible to clean up a 10-day old spill unless it's on the beach. By 10 days, the viscosity and surface tension have changed enough to make dispersants useless and skimming impracticable.

14-57 p. IV.A.14: Table IV-3 - Reference is Manen, C.A. and Pelto, M.J. 1984.

14-58 p. IV.A.15: It should be noted that blowouts have a high probability of forming mousse, which is difficult at best to clean up.

14-59 p. IV.A.19, para. 1: The section on oceanography cites the possible existence of sea ice in the drilling area. Since sea ice would be a constraint on OCS development, why doesn't the constraints section mention sea ice?

14-60 p. IV. A.19: Weather should also be considered a constraint on oil and gas development, such as it affects oilspill cleanup response, support vessel traffic, etc.

14-6 Table IV. 11: There is no apparent relationship between the number of exploration wells expected to be drilled and the resource estimates for these lease areas. Why? Why is this sale expected to have only 5 exploration wells for 364 MMbbls when St. George Sale 70 projects 55 wells for 570 MMbbls?

14-62 p. IV. A.21: The Balboa Bay terminal and oilspill risks on the south side of the Alaska Peninsula are not modeled or considered for oilspill risks, yet Unga Island mining is mentioned as a major action affecting the North Aleutian Basin.

14-63 p. IV.A.23, para. 1: Change 2.61 to 3.956 to match the total volume being tankered.

14-64 Table IV. 13 and IV. 14: Exposure times are necessary to portray this data.

p. IV.B.1.a: This section needs extensive revision. The author relies on secondary and teritiary sources, including previous environmental impact statements for such data as mortalities. Primary references should be used.

14-65 The section should be revised by major species of interest to at least provide the following kinds of clearly presented information:

a) Red king crab. Behavioral and physiological effects of acute and long term exposures of crabs to hydrocarbons. Lethal concentrations of water soluble and total hydrocarbon fractions to developing life history stages. Effect of hydrocarbon exposure on reproductive activities (locating mates and copulating), and growth in terms of food requirements and possible reductions in prey.

b) Salmon avoidance - how well does the experimental evidence describe avoidance? What are the real possibilities of delays in migration of returning adults and possible late arrivals on spawning grounds? How could growth and survival of outmigrating salmon be affected by avoidance to regions of lower grazing (food abundance) quality? What are the sublethal effects of hydrocarbon exposures on juvenile salmon and how might they affect behavior in feeding and growth? What are the effects of seismic activities on juvenile salmon? These questions are especially pertinent as all such activity is proposed in the DEIS for periods of salmon outmigration.

c) Herring and capelin. What are the impacts of oiling optimum spawning habitats and toxic and sublethal exposures to spawning fish?

14-66 p.IV.B.2 and 3: Tables 13 and 14 are repetitive.

14-67 p.IV.B.3: This is MTL (mean tolerance limit), not TLM. Sensitivity data are from Rice el al, 1979 and are cited as such in Malins and Hodgins. Hameedi, 1982 is also Rice.

14-68 p.IV.B.5: This section on the effects of drilling muds needs a discussion of how depth influences the possible effects of drilling muds.

14-69 p.IV.B.6: Paragraph on formation waters should be moved to the end, i.e. taken out of the middle of the drilling muds discussion. Discussion needed on smothering and the modification of this effect by depth and current regimes.

14-70 Discussion of dispersants is misleading. It implies that dispersants will be used as a clean up mechanism. At present there is no plan to use dispersants as a standard clean up mechanism. Problems with dispersant use include the regulations and attitude concerning use, effectiveness in cold water, efficiency in cold water, and logistics of application for the Alaskan Peninsula.

14-71 p. IV.B.9: The description of habitats (pelagic, benthic and nearshore) needs revision. The NAB consists of three major oceanographic domains - coastal, midshelf and outershelf - and adjacent areas include major bays and lagoons. Fish and wildlife use is not the same in each, can change by species, subareas within each broad habitat-type, and by depth and season. Enough information - much not used in this DEIS is available to provide such descriptions. They are necessary for predicting environmental consequences.

14-72 p. IV.B.10: While planktonic organisms may lack the organs to degrade the toxic components of petroleum, they still do a pretty good job of metabolizing the stuff. See Van Baalen, 1982.

14-73 p. IV.B.11: More information needed about possible transport of oil to the benthos.

14-74 p. IV.B.12: What is meant by nearshore? Adult salmon are congregating in estuaries prior to ascending to freshwater spawning areas, not prior to their spawning migration. Herring use the Port Moller - Herendeen

Bays and inner Bristol Bay (Togiak-Goodnews Bays) for spawning. No king crab larvae have been found inside of 20 m depth in Bristol Bay. Most Tanner crab larvae are abundant beyond the 50 m and the 70 m contours. Are these nearshore habitats in the NAB? There seems to be some confusion between offshore and coastal data especially as they pertain to biological use. Nearshore NAB waters are usually well-mixed and quite turbulent.

14-75 p. IV.B.13: As Moles et al. (1979) were working with juveniles, the argument presented here regarding salmon sensitivity is tenuous. Information about the difficulties in predicting the effects of sublethal exposures both in the long and short term is confusing as presented.

14-76 The transport and fate and spilled oil in nearshore areas is likely to be much different than in offshore areas. The potential for elevated water column concentrations, accumulation of oil in bottom sediments, oiling of beaches and probable impacts should be more adequately considered.

14-77 p. IV.B.13-14: The seasonality of use and use of different coastal corridors by the various salmonid species (including juveniles and adults) needs to be amplified. Seasonal features should include how timing is affected from year to year by changing environmental conditions. Individual stock units throughout Bristol Bay could be substantially impacted by oil spills in the NAB. The stock concept must be evaluated in the DEIS with respect to "regional populations" and migrating juveniles and adults. This would include discussions of possible impacts to Alaska Peninsula stocks and populations versus those originating in Inner Bristol Bay or other parts of Alaska. What are the implications of delayed migrations, avoidance movements to less desirable feeding areas, etc? What are the probable differences in level of impact from hypothetical oil spills in different habitats and seasons?

Information about juvenile outmigrations obtained to date pertains primarily to sockeye salmon. Most has been obtained beyond the 20 m isobath and little sampling has been conducted west of Port Moller. Sampling periods have been restricted to the period June-August. Thus juvenile chinook have not been sampled as they move through the area in late April and May. Pink and chum salmon are believed to migrate through the very nearshore (10-15m depth) portion of the lease area in July and August. The movement of pink and chum has not been well-documented due to their small size and location. Nor is the coho outmigration well-documented, although it is thought to be similar to that of the sockeye but later in the summer.

14-78 p. IV.B.14, para. 2: Discharge dilution is a function of currents and turbulence, not offshore distance as this paragraph implies. Information on ground-level discharges does not make sense.

14-79 p. IV. B.14: A pipeline break on land could spill oil into upstream salmon waters.

14-80 p. IV.B.15: How are salmon fry (by species and times) likely to be affected by offshore oil and gas development in Bristol Bay? Where is the reference for 1 ppm?

14-81 Table IV-15: Do final probabilities mean the same thing as combined probabilities? If so, text should be consistent.

14-82 p. IV.B.16: The site specific analysis is totally based on the MMS Oil Spill Risk Analysis. Given the importance of salmon fisheries in Bristol Bay and the importance of the fisheries-oil issue this is inadequate. The section could be improved with better descriptions of nearshore transport and fate and seasonality considerations.

14-83 Unimak Pass discussions should be expanded due to its importance as a migratory corridor importance for both juveniles and returning adults.

14-84 p. IV.B.17: Port Moller salmon stocks and populations and their vulnerabilities must be better described in the DEIS as they appear most at risk from the proposed action. What percentages of the total Bristol Bay run, in numbers of fish and dollars, are these fish? The environmental effects of small cumulative oil spills should be considered.

14-85 p. IV.B.18: Possible effects of seismic activities on salmonid outmigrations, especially in the Port Moller area are not well described in DEIS. Summary section is not very convincing as to what level of impact might occur.

14-86 p. IV.B.20: Clupeiformes do not have planktonic eggs. This whole section on clupeiformes reads a lot like the section on salmonids with salmonids/clupeiformes interchanged. This means that the impacts assessed here are not particularly well done. Given the monetory value of these fisheries, this section needs extensive revision.

14-87 An oil spill in the Port Moller area could impact a variety of age classes. Since they are repeat spawners, losses might be lessened. However, severe reductions in the spawning population could result from a spill in spring. Year class reductions could result from larval and juvenile losses later in summer. What about avoidance and oiling of spawning habitat? Eggs and larvae do not represent two age classes.

14-88 p. IV.B.21: Malins and Hodgins, 1981 should be Smith and Cameron, 1979. Also this exposure was for 6 days. "Natal" usually refers to mammalian species.

14-89 p. IV.B.23: Port Moller herring could be severely impacted by an oil spill in the spring as well as late summer. Recovery might take many years. No one can say because these stocks are presently not well-defined. A spill reducing these stocks would likely destroy the fishery operating upon them.

14-90 What is the basis for conjecture that herring stocks in Port Moller would be replenished from elsewhere? The MMS needs to consider the regionality of herring stocks. It should be emphasized that no recent data are presented in this section even though aerial herring surveys

are annually conducted by the ADF&G.

14-91 p. IV.B.23: Where is discussion of AMOCO CADIZ spill on plaice? Correlation between aromatic hydrocarbon concentration in sediments and invasive neoplasms in flatfish? Correlation between exposure to aromatic hydrocarbons and decreased fecundity in flatfish?

14-92 p. IV.B.26: The groundfish section is presenting a lot of misinformation and conjecture. Either needs to be rewritten or include many more references (if they exist). Nursery area information currently is largely speculative.

14-93 p. IV.B.29: Seasonality of groundfish occurrence in the NAB and adjacent waters needs to be further reviewed. Which species overwinter in the NAB? Possibly there is some overwintering in the deeper waters to the west in the proposed lease area. It seems likely that most species migrate to the deeper warmer waters over the slope and shelf break.

14-94 p. IV.B.29: The entire section on red king crab needs to be revised for the FEIS. Much better information than that presented is available to predict probable levels of impact on this species. This is especially true for larval and juvenile distribution and abundance (see OCSEAP RU's 609 and 639). Given what is known about the reproductive ecology of this species (that is, it is contained within relatively narrow geographic boundaries in the NAB), it's commercial worth, and currently reduced population numbers, much more detail is needed. Of all the species considered, the red king crab must be considered the most vulnerable to potential impacts and this fact is not clearly stated anywhere in the DEIS. Possible impacts to crabs seem to be de-emphasized by discussions of bivalves and shrimp. More documentation is needed.

14-95 p. IV.B.30: Possible effects are too easily dismissed. An onshore wind could keep oil directly over king crab mating, hatching, rearing areas with disastrous results.

14-96 p. IV.B.34: Why isn't the magnitude of the effects on king crab identified as SEVERE, which is what the discussion implies.

14-97 p. IV.B.33: Information about the juvenile king crab benthic habitats is more available than indicated in the DEIS. Important rearing areas are apparently located directly offshore of Port Moller and to the east and further inside Bristol Bay. These benthic areas typically consist of a rock/pebble/shellhash substrate that affords shelter and appropriate food resources for the juvenile crabs.

14-98 p. IV.B.34: More discussion is warranted on the hypothesized reasons for the current decline in the Bering Sea red king crab populations (i.e. reduced number of mature males, losses to fisheries, disease predation, transport of larvae away from settling areas of having optimum benthic habitat, etc.) How might any of these be affected by possible oil spills (including seasonal considerations) and what would it mean in terms of recovery of these crabs.

14-99 p. IV.B.48: More current information is available on sea otters. This species occurs in high numbers and densities inshore of the proposed leasing area, and oiling losses might be greater than indicated in the DEIS, especially if oil reached Bechevin Bay and Izembek Lagoon (including the fronting coastal zone) during spring and summer months.

14-100 p. IV. B.52: Even "very transitory and brief in duration" noise can elicit a startle reaction that could have harmful effects. It should not be assumed that the Marine Mammal Protection Act will prevent this, as enforcement in a remote and unwatched area is unlikely. Disturbance effects could well be major at local rookeries. Also, there is not sufficient justification for the statement that the frequency of disturbance events would be low. Many over flights per day can be expected.

14-101 p. IV.B.57: If a primary source, i.e. someone besides Geraci and St. Aubin is referenced, the statement can be changed to "do evaporate more quickly."

14-102 p. IV. B.57: The whales were seen swimming through the seep area, not through the oil as stated here.

14-103 p. IV. B.61: The data does not indicate that the acoustic energy is high, but only widespread. The decibel levels are usually not far above ambient. There is a distinction. Again, "a high degree of tolerance" as exhibited by avoidance displays may be a poor criteria to judge tolerance, as it is perhaps the last possible reaction the whales can display for observation. Other actions such as change in blow rate, socialization, swimming speed can occur sooner and at greater

distances. Also, correct the text to read "North Aleutian Basin" rather than "St. George Basin".

14-104 p. IV. B.63: "Tolerance" to seismic noise has not been demonstrated in the sense applied here; only that avoidance behavior has a limited range at which it is detectable.

14-105 p. IV. B.73: Fin whales are regularly sighted in the North Aleutian area. The lack of sightings referred to here must relate to the lack of survey effort.

14-106 p. IV. B.73: We certainly take exception that effects to right whales can be concluded to be MINOR, as any effect, given the duration of the proposed action, could be both long-term and significant to this severely depleted population.

14-107 p. IV. B.74: Oilspill contact probabilities for fin whales, a pelagic species of the shelf edge, cannot possibly be the same as for gray whales, due to their very different migrations and habitats.

14-108 p. IV. B.80: There is no evidence to indicate that whales would be able to detect and leave or avoid an oilspill area. It may be equally reasonable to assume that they would be unable to find their way out of such an area.

14-109 p. IV. B.84: The conclusion of "unlikely interaction" is contradicted by the facts and other statements in this section.

14-110 p. IV. B.88: We would consider that catch losses of 1 to 2 per cent for crab and groundfish should be considered MAJOR not MINOR. Such losses cannot be considered to be evenly distributed among all fishing vessels, or that all vessels are equally capable of absorbing such losses.

14-111 p. IV.E.4, para. 1: Resource area 7 has a 99.5% chance of being contacted if an oil spill should occur at spill point D-1. DEIS must indicate launch point and time period when talking about conditional possibilities.

Section IV-E. Alternative IV.

14-11a We question how many of the effects would be reduced by this Alternative as there is no decrease in resource estimates or industry activity scenarios. MMS should acknowledge that no oil resource is expected in the deferral area, and therefore Alternative IV should not affect the impacts to be expected.

14-112 p. IV.E.4, para. 1 and 4: Launch points and time periods must be indicated when talking about conditional probabilities.

14-113 p. IV.F.1: Title should be "Other Effects".

14-114 p. IV. F.4: We believe the statement regarding the reduction in oil spills is in error. Because of the low proportion of hydrocarbon resources in the deferral area (essentially none), the most likely number of spills should not change, not "would be reduced from that of the proposal" as stated here.

14-115 p. IV. G.2: The gray whale migration should be considered in two phases: spring (March - June) and fall (October - December). Also, we do not agree with the assumption that unavoidable adverse impacts to endangered whales. If impacts occur, they could well be major, considering the low population levels of these species.

14-116 p. IV. I.1: The statement on endangered species fails to resolve how loss of individual endangered species can be considered to have "minor" overall population effects. By their very endangered nature, such losses must be considered to be of great concern.

14-117 Appendix J: Several pages are out of order (beginning on page 5).

Section IV. J. Worst Case Analysis.

14-118 We believe that the maximum resource scenario (Appendix A) should be the basis for this analysis. Under this case, impacts to endangered whales are rated as moderate. The worst case analysis fails to rate the level of the effects described. It also fails to rate other impact categories (i.e. to fisheries, marine mammals, etc.).

14-119 p. IV. J.1: The assumptions for gray whales are tenuous at best. Certainly item 12 should be considered high.

14-120 p. IV. J.4 and 5: Same comment as above for right whales.

Section V. Consultation and Coordination (pp. V-A-1 to V-D-2).

14-121 p. V. A.1: It is not true that the size of the original planning area was considerably greater than the area analyzed as the proposal?

APPENDIX

UNREFERENCED MATERIALS IN THE NORTH ALEUTIAN BASIN DEIS

Several major OCSEAP studies that were or are presently being conducted have not been included in the North Aleutian Basin DEIS. Many are concerned with the fishery resources of Bristol Bay and contain information pertinent to the leasing action that is unavailable elsewhere.

1. RU 647. Environmental Characterization of the North Aleutian Nearshore Region. 1984. Prepared by Kinnetics Laboratories Inc. This two-volume final report provides a comprehensive literature review and synthesis of information regarding the North Aleutian Basin lease area. Volume 1 consists of an environmental characterization, description of the apparent ecological processes of the region (including the development of a conceptual model), and a discussion of this lease area with respect to proposed OCS activities. Volume 2 is an annotated bibliography comprising almost 500 published and unpublished literature sources.

2. RU 639. Distribution of Red King Crab Larvae and Juveniles Along the North Aleutian Shelf. 1984. Prepared by VTN Oregon, Inc.. The final report describes the results of larval and juvenile crab studies performed during three cruises to Bristol Bay in 1983. A major hatch was observed in May although it was not synchronous throughout the study area. Larvae were observed first in the coastal NAS and later in inner Bristol Bay. Larval growth rate seemed to be greater in the coastal NAS, an observation reflecting the normally warmer water temperatures in this area earlier in the season. Larval densities were low throughout the coastal domain that year, but were exeedingly low in Kvichak Bay and from Port Heiden, westward to Cape Seniavin. Greatest densities were over the midshelf domain an area where prevailing currents might not deliver pelagic larvae to optimum substrates where juvenile survivorship is hypothesized as being greatest. Sediment samples were collected to investigate possible associations between young crab and gravel/shell substrate. Gravel sediments are somewhat restricted in the coastal NAB and were found in the Port Moller and Cape Seniavin region and were more widespread in Kvichak and Togiak Bays. Certain invertebrate assemblages were more common over the substrate; they included tube worms, sponges, gastropods, barnacles, and attached bivalves. Virtually all sediments at or deeper than 50m were comprised of sand. All juvenile king crabs captured were found inshore of 50m. Juveniles (less than 20mm C.L.) were most abundant off Port Moller, Cape Seniavin, Port Heiden and Walrus Island in Togiak Bay. The results should be viewed as preliminary as they pertain to king crab ecology. Further quantification of juveniles in these selected benthic habitats is needed. It is hoped that these can be accomplished on an opportunistic basis with other ongoing OCSEAP studies in 1985. Given the depressed nature of the red king crab population at this time and

the past worth of this fishery, these areas should be considered as critical habitats especially in the region off Port Moller.

3. RU 659. Seasonal Fish Use of Inshore Habitats North of the Alaska Peninsula. Ongoing Study by Dames & Moore. The project is currently entering its second field season. During 1984 more than 88,000 fish were captured along six transects between Port Heiden and Unimak Pass. Most sampling was conducted inshore of 70m depth due to a dirth of fish information from this zone. Yellowfin and rock sole dominated bottom catches in contrast to Pacific sandlance and rainbow smelt abundance in the pelagic environment. Although characterization of the outmigration of juvenile salmon was the emphasis of this work, late arrival at the study area and poor weather conditions precluded the acquisition of much new information. A comprehensive review of the first year's work is expected in April. The second year of the study will focus entirely on salmonids. The hypothesized offshore movement of sockeyes in the Port Moller region will be examined this summer. Reduced funding levels will only allow sampling for a 30 day period in 1985 (June), which means chinook, chum, pink, and coho juveniles are not expected to be abundant in catches. Sampling will be limited to transects located between Cape Seniavin and Izembek Lagoon. The hypothesized offshore movement of sockeyes in the Port Moller region will be examined this summer.

4. RU 658. North Aleutian Shelf Ecosystem Characterization Study. Ongoing Study by LGL. This project is in its second year and is studying the ecological processes in the Izembek Lagoon-to-Port Moller region. Particular emphasis is being placed on nearshore contributions of nutrients to the high-energy coastal zone inside 5 km. Contributions of imported nutrients and primary production relative to that within the study area are also being measured. The distributions and abundances of dominant fish and wildlife species are being surveyed in relation to their food and habitat requirements. A comprehensive progress report is expected in September 1985.

5. RU 609. Distribution and Abundance of Decapod Larvae in the Southeastern Bering Sea. 1983. Univ. of Wash. (Armstrong). This final report provides information on larval decapods and some possible ramifications of oil and gas development in the St. George and North Aleutian Shelf lease areas. The biologies and fisheries of major decapod groups are reviewed. Information is presented on king, Tanner, and other crabs, and shrimp and hermit crabs. Data on larval distribution and abundance, relationships to benthic adult stocks, molt frequency, and annual variations in physiological and biological factors, are considered in light of planned OCS activities in the southeastern Bering Sea. Literature on oil toxicity to Crustacea is reviewed.

6. RU 623. Ecological Characterization of Shallow Subtidal Habitats in the North Aleutian Shelf. 1983. Prepared by VTN Oregon, Inc. This study was initiated to describe the composition of shallow subtidal benthic communities in the North Aleutian Basin and to determine their interactions with sea otters. Fieldwork by this project was primarily carried out during the summer of 1982, although

aerial surveys of sea otter distributions continued through the early winter of 1983. The data obtained suggest a strong seasonality in the distribution of otters; there are approximately 10 times as many otters in the North Aleutian Basin during July - September than at other times of the year. It is hypothesized that otters move to the south Alaska Peninsula during the winter through False Pass and Unimak Pass or they move west to the eastern Aleutian Islands with advancing season.

7. RU 624. Feeding Ecology of Juvenile King and Tanner Crabs in the Southeastern Bering Sea. Prepared by Battelle, Pacific Northwest Laboratories. In 1982, a field and laboratory project was initiated to determine the food habits and nutritional requirements of juvenile king and Tanner crabs. Crabs were obtained from the coastal waters of the North Aleutian Shelf lease area in June, August, and October, 1982. Juvenile king crab were concentrated off Port Moller whereas Tanner crab were found in the Amak Island - Black Hills region. Both species were captured in greatest numbers at or near the 50m isobath, although the smallest king crabs were found in shallower waters among cobble and rock habitats with abundant associated epifauna. Diel feeding was observed in juvenile king crab with peak feeding occuring between 0000 and 0800 h. Daily rations were estimated for June and August at 6.30 and 11.92 mg dry weight per gram crab wet weight per day, respectively. The caloric intakes by juvenile king crab were 17.5 and 42.2 calories per gram crab wet weight per day in June and August. Two polychaetes, a sand dollar, and a bivalve accounted for 92% of the soft tissue dry weight in the overall diet. In general, juvenile king crab seem to feed most heavily on poorly motile benthic organisms living at or just beneath the sedimentary surface. Immunological assessment of unidentifiable items in the crab gut revealed that the small sized king crab were preying on various polychaetes, oligochaetes and nematodes. Potential impacts on crabs from OCS activities resulting in food web or habitat disruptions are discussed.

8. RU 643. Quantitative Determination of the Effects of Oil Development in the Bristol Bay Region on the Commercial Fisheries in the Bering Sea. This is an ongoing study by NMFS/NW&AFC. The biological impacts of various hypothetical oil spills are predicted through numerical studies and computer simulations. The spill sites are positioned along the 50m isobath off Port Moller, Port Heiden, and Cape Newenham. These sites were selected based on their assumed importance to red king crab, sockeye salmon, and yellowfin sole. The selection of these candidate species also afforded an opportunity for numerical study of commercial species possessing differing habitat requirements. Surface spills and subsurface spill scenarios have been modeled using state-of-the-art algorithms generated by RAND, SAI, and the NMFS. Due to the nature of the biological model used, other commercially valuable or ecologically important species are considered in the analysis. The work has involved the preparation of several comprehensive species accounts and several new computer routines. Biological losses are estimated for egg and larval stages as well as

in lost biomass for other age groups. The extent of loss is compared to the productivity of the eastern Bering Sea. Tainting impacts are also discussed especially as they apply to migrating salmonid stocks. This work has resulted in the development of an algorithm, based entirely on empirical data, to study the sedimentation of oil and its effect on benthic population. Simulations suggest this is where ecosystem impacts may be most long-lasting. It is unfortunate this report was not available for inclusion in the DEIS but it should definitely be utilized in the FEIS. The report should be available in June.

9. RU 611. Modern Populations, Migrations, Demography, Trophics, and Historical Status of the Pacific Walrus. 1984. Univ. of Alaska (Fay). This report is based on a lifetime of work by the P.I. on Pacific walrus and constitutes a synthesis of much of what is known about this species in Alaskan waters. The final report addresses potential OCS impacts on this species as well as describes information needs relative to population dynamics and habitat requirements.

10. OTHER STUDIES. DEIS writers should review available information on the sedimentation processes active in the coastal portion of the DEIS study area. This work was conducted in the early 1980's by PMEL as part of the OCSEAP-sponsored NASTE experiment. The results of this study in conjunction with ongoing projects of the MMS (on suspended particulates and transport in the surf zone) would enhance descriptions of differences in the transport and fate of spilled hydrocarbons in offshore, coastal and nearshore systems.

Response 14-1

Because they are the most current and comprehensive sources of life-history information for fisheries resources, summary documents have been used and cited frequently in the descriptions of fisheries resources (Sec. III.B.1). Synthesis editors have not been credited with original research; they are cited as the sources of the information used. Summary documents, such as the one by Thorsteinson (1984), are valuable as a synthesis of information gathered by experts; these documents often include those who have participated in original research on these topics. Where an editor has generally summarized information in these documents rather than specifically citing an individual author, the editor of the summary document (or the author of a particular chapter, if cited) has been noted as the source of the summarized information.

Response 14-2

This concern is addressed in Responses 4-70 and 6-119.

Response 14-3

The oil-spill-trajectory analysis is based on center-of-mass trajectories and neither specifies nor calculates water column oil concentrations. The oil-spill-trajectory-analysis (Sec. IV.A.3.c) contains no mention of 5-parts-per-million concentrations of oil in water.

Response 14-4

Aspects of this concern are addressed in Responses 1-64, 4-6, 6-111, 6-120, and 6-125. The discussion of hydrocarbon concentrations in the water has been expanded in Section IV.F.1 and also further developed in a nearshore-spill scenario concerning the Port Moller area which has been added to the DEIS.

NOAA states that, "If it is assumed that spilled oil remained offshore the MMS analysis is probably accurate." The oil-spill-risk analysis (OSRA) does not make this assumption, but rather calculates shoreline or nearshore contacts (the model assumes that if a trajectory approached within 1 to 3 km of shore, the shore would be contacted by the spill). For the proposal, the probability of land (including the nearshore) contact with spill(s) of 1,000 barrels or greater is only 9 percent through a period of 10 days. Thus, most spills would remain offshore and, according to NOAA's criteria, the MMS analysis should be considered accurate.

Also note that modeling spills in the surf (nearshore) zone would provide only marginal improvement in the analytical precision of the EIS analysis. In the absence of a surf-zone model, the EIS analysis assumes that the entire land segment could be contacted by the center-of-mass oil-spill trajectory. The analysis of effects from this spill contact is predicated on the assumption that the entire land segment (several tens of kilometers) is contacted. This latter assumption is conservative and leads to an overestimation of effects. Completion and use of the surf model would allow the analysis to pinpoint which portion of the land segment would be contacted by oil, and would lessen the overestimation of risk assumed for the EIS.

Response 14-5

This concern is partially addressed in Response 6-111.

The trajectories generated by the model are not linear--they show significant responses to frequently fluctuating winds. The use of these trajectories is far less biased than the use of other trajectories that conform to an arbitrary, presupposed trajectory shape.

The ocean serves as a filter in the air-sea momentum transfer so that currents have a tendency to travel in the prevailing-wind direction, as has been demonstrated using observed as well as computed trajectories (Liu and Leendertse, 1981a, b, c; 1983a, b).

Putnin (1966) analyzed Alaskan weather data of many years and concluded that Alaska has no spring season. Subsequent seasonal trajectory analyses (i.e., Liu and Leendertse, 1981b) demonstrated that weather patterns in the Bering Sea also can be represented by three seasons--there is no oceanic spring in the Bering Sea. A simple inspection of summer-versus-fall trajectories in Liu and Leendertse (1981b) clearly illustrates that summer and fall trajectories are very similar and really represent only one suite of trajectories.

Response 14-6

This concern is addressed in Response 6-111.

Repsonse 14-7

The MMS does not agree that the analysis in the EIS has been "skewed toward the general and discounted for the specific," and takes exception to the innuendo that MMS analysts would bias the analysis toward lower effects. The commentor should note that, at this point in the leasing process, it is not known specifically where development will take place, or even if it will. Therefore, it is not known specifically when or where oil spills will occur or what habitats and resources will be affected. In order to make such projections, all available and pertinent information on biological resources (abundance, life history, distribution, etc.), oil-spill fate and behavior, and toxic effects, must be considered in conjunction with a set of hypothetical parameters about the level of industry activity that will occur during exploration, development, and production in this area. The scenario of industry activity is based on the estimate of economically recoverable oil and gas resources. All projections of industry operations, and projected oil spills, are based on this estimate. For this proposal only 1 large oil spill (1,000 barrels or greater) is considered reasonable to occur over the 26-year life of the field. In addition, there only two platforms are projected (one for oil, one for gas). It is not known precisely where these platforms will be located or where or when the 1 oil spill will occur. Therefore, the analysis considers a number of possibilities. Some of the more extreme possibilities involve the occurrence and contact of a 100,000-barrel spill on certain resources when the most valuable and sensitive lifestages are present, thereby yielding a moderate or major effect on the regional population. In almost all of these cases, however, the EIS states that the probability of this type of event is fairly remote. It cannot be reasonably concluded that these "extreme cases" would occur. Therefore, the conclusions, which address what is reasonably expected to occur, may state lower effects (i.e., minor).

This concern is partially addressed in Responses 1-45 and 6-28.

Response 14-8

The mean-case scenario is used as the basis for analysis because it is the most likely set of events that could result if the North Aleutian Basin (Sale 92) area is leased. The maximum case should not be confused with the worst-case scenario. In terms of national energy needs, the maximum case would be a preferred scenario.

The maximum- and minimum-case scenarios provide a range of resource levels and development activity and are analyzed to provide the public with the total range of effects that could result from leasing. However, the decision on leasing should be based on the most likely set of occurrences, which is the mean case.

Response 14-9

The analysis of effects in the EIS does consider probable changes in the ecosystem. The approach in this EIS focuses on changes in important ecosystem components (fish, birds, mammals, etc.), rather than describing total ecosystem changes by tracking changes on effects through habitat or trophic linkages. Each analysis considers direct effects on these important resources (if appropriate), indirect effects that could occur from habitat changes, effects on food sources used by these key ecosystem components, and cumulative effects. This analytical approach is designed to address the significant environmental issues identified during scoping (i.e., the effects on fish, birds, and mammals from activities associated with the proposed action), thereby meeting the requirements of NEPA and providing the Secretary of the Interior with tangible conclusions upon which to base a decision concerning this lease sale. Alternative approaches are extremely complex, difficult to define conceptually, and may prove to be more of an academic exercise than a useful decisionmaking tool.

Response 14-10

This concern is addressed in Response 1-21.

Response 14-11a

The OCSEAP studies pertaining to the North Aleutian Basin have been reviewed and, where appropriate, information has been incorporated into the text (Sec's. III.B.1. and IV.B.1.a.(1)).

Response 14-11b

The analysis in the FEIS (Sec. IV.B.1.a.(1)) addresses the potential effects of an oil spill on juvenile salmon that are outmigrating.

Response 14-12

This concern is addressed in Responses 1-2, 1-3, and 1-4.

Response 14-13

The MMS agrees that stock definition of herring in the Port Moller estuarine complex is lacking; however, this does not preclude making a qualitative assessment of oil effects on the portion of the population that spawns there. The EIS concludes that a major effect would occur on the regional herring population if oil contacted vulnerable lifestages (larvae and eggs) present in this area. This conclusion is based on the conservative assumption that all herring larvae and eggs within the zone of contact would be killed. The lack of stock definition of the Port Moller herring fishery has not precluded the development of fishery-management plans for the commercial harvest of herring in this region.

Response 14-14

The seasonality of the occurrence of Pacific sand lance, capelin, rainbow smelt, and eulachon is discussed in Section III.B.1.

Response 14-15

A summary of the known population dynamics and demography for the Bristol Bay or North Aleutian Basin population of sea otters is described in Section III.B.3. of the EIS. The EIS does not suggest that this area is low-quality habitat for sea otters.

Response 14-16

The EIS analysis focuses on the effects on important ecosystem components (i.e., fish, birds, and mammals) and includes discussions on changes or effects on important habitats. This approach subordinates the effects on habitats in order to emphasize the effects on the important species groups that occupy them. This approach is not intended to deemphasize or devalue the importance of the special habitats identified by the commentor. For additional discussion on the analytical approach in the EIS, refer to Response 14-9.

Response 14-17a

The Summary of the EIS for Sale 92 has been revised to include cumulative effects and the effects of an offshore-loading scenario for Alternative I that has been added to, and analyzed in, the FEIS in conjuction with the proposal (Sec. IV.B.2).

In regard to Alternative III (Delay the Sale), if the Secretary of the Interior selected this alternative, the environmental assessment process would have to be reinitiated; and all assumptions would have to be reviewed and updated the next time the North Aleutian Basin appeared on the 5-year lease-sale schedule. Any new information received during the delay period would be incorporated into the environmental assessment analysis. A list of studies proposed by the MMS for the period of delay is included in Section IV.D.

Response 14-17b

Table S-1 has been revised to indicate the effects on resources if a spill occurred and contacted nearshore areas. Footnotes are provided only to further clarify the effects stated in the body of the table.

Response 14-18

Based on the extent and detail of the comments, it appears that not all other interested parties had a problem in reviewing the DEIS.

Response 14-19

The text has been amended in response to this concern (see Sec. I.D. of the FEIS).

Response 14-20

This concern is addressed in Response 1-21.

Response 14-21

Alternatives to the proposed action are developed from input provided by industry, federal and state agencies, and the public in response to the Call for Information, and are combined with MMS staff input. After lease-block-deferral alternatives are developed, resource estimates are calculated and the level of industry activity is estimated.

In response to the Call for Information, the U.S. Fish and Wildlife Service requested a deferral of all blocks within 12 nautical miles (13.8 statute miles) of the Alaska Peninsula and in water depths less than 70 meters, to provide protection for sea otters in southern Bristol Bay. The Bristol Bay Coastal Resource Service Area (CRSA) Board requested a 40-kilometer (25-mile) deferral along the Alaska Peninsula; and the Aleutians East CRSA Board requested a 48-kilometer (30-mile) deferral along the peninsula. These requests were incorporated into the development of Alternative IV (Alaska Peninsula Deferral). Resource estimates have been revised since publication of the draft EIS. Alternative IV has a conditional mean estimate for undiscovered recoverable resources of 331 MMbbls of oil and 2.20 TCF of gas (Table II-1). This alternative reduces the size of the area, resource estimates and level of activity compared to Alternative I.

Response 14-22a

Potential Stipulations and Information to Lessees (ITL's) are proposed to reduce or eliminate the potential effects identified in Section IV. A Secretarial decision has not been made regarding these mitigating measures; they are noted here as prospective measures that could further mitigate the potential effects of this lease sale. The Secretary has imposed similar measures in previous federal oil and gas lease sales; and the use of these measures is likely to continue unless more effective mitigating measures are proposed or developed. The mitigating measures that are adopted will appear in the Notice of Sale. Although the analysis in this EIS does not assume that the measures in Section II.C.1.a. (Potential Mitigating Measures) are in place, these measures are evaluated in Section II.C.1.d. (Effectiveness of Potential Mitigating Measures).

Response 14-22b

The EIS is based on economically recoverable resources. Extraction of hydrocarbons located in small structures would not be economic; only large fields would be economic. The geology and small size of the North Aleutian Basin Planning Area limit the probable number of large prospects.

If oil companies found many small prospects and no large prospects, it is unlikely that any platforms would be placed. Development would be assumed only if a discovery were comprised of one or two structures (near each other) that together approached the mean-resource value.

Response 14-23

The ITL on Areas of Special Biological Sensitivity has been modified to include Unimak Pass.

Response 14-24

The comment confuses two ITL's. The ITL on endangered whales ". . . would effectively reduce the risk (due to the issued NTL's) on endangered whales . . ." The NTL's provide a stronger form of protection to meet Endangered Species Act concerns. Regarding the ITL on birds and marine mammals, since an ITL is only advisory in nature and not enforceable as a stipulation, there can be only an increment of benefit, which depends on the lessee's ability and capability to follow the ITL recommendations.

Response 14-25a

This concern is addressed in Responses 4-70 and 6-119.

Response 14-25b

Table II-2 of the FEIS has been revised to reflect this concern.

Response 14-26

The text has been amended to reflect this concern (see Table II-2, [Fur Seals, Other Pinnipeds and Sea Otters] in the FEIS).

Response 14-27a

One of the guiding principles of writing EIS's is to limit bulk and enhance clarity by concentrating the analysis on effects rather than on lengthy descriptions. A corollary of these principles is to describe in detail only those aspects of the environment that may be affected by the proposed action; other, less important aspects should be concisely summarized. Certainly no significant effects from oil and gas leasing are expected to occur on meteorology and oceanography in Bristol Bay.

The purpose of the oceanography and meteorology descriptions in an EIS is to provide the reader a brief introduction, but not to provide sufficient detail to reconstruct the oil-spill-trajectory model.

Response 14-27b

The descriptions of fisheries resources, marine mammals, and commercial fisheries provided in Section III are considered adequate for the purpose and scope of the EIS. The CEQ's "Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act" guides agencies to produce EIS's that are "analytic rather than encyclopedic." The content of these subsections in Section III is believed adequate to support the analytic discussions following in Section IV. References are cited, as appropriate, to provide additional background information to support the descriptive discussions in Section III. Most distribution maps cover large areas, because the distributions of most key biological species groups cover large expanses. The areas that could be potentially influenced by the hypothetical development scenario on the southern side of the Alaska Peninsula are restricted to areas in and adjacent to Balboa Bay and the proposed tanker route. Adequate descriptions and analyses are provided for the resources that occupy this area in both Sections III and IV. The concern that ecosystem and habitat linkages have received little attention in the EIS is addressed in Responses 14-9 and 14-16.

Response 14-28a

It is the policy of the MMS not to include a lengthy description in Section III of an EIS, especially if the material has been covered in detail in a previous EIS. A brief description is given and references are listed. Pertinent material from the previous document is summarized, and the previous document is incorporated by reference (CEQ Regulations).

In this case, a more detailed discussion of earthquake hazards to onshore and offshore oil development can be found in the St. George Basin (Sale 70 FEIS). Additional information can be found in other references cited in Section III.A.1.c. of this EIS.

Response 14-28b

This concern is addressed in Response 6-117.

Response 14-28c

This correction has been made in the FEIS.

Responses 14-28d, e, f, g, h

This information has been incorporated in Section III.A.3. of the FEIS.

Response 14-28i

The referenced sentence and the cited sources were reviewed; the sentence was found to be a correct and referenced summary of compatible findings by McNutt (1981) and Overland and Pease (1981).

Response 14-28j

Martin and Bauer (1981) is the citation.

Response 14-28k

The explanation given for the acceleration of ice bands has been removed from Section IV.A.3. of the FEIS.

Response 14-28l

The appropriate citation is Kinder and Schumacher (1981b).

Response 14-29

A source citation has been added in Section IV.B.1.a.(1) of the FEIS.

Response 14-30

The statement that food is less abundant in inner Bristol Bay than farther seaward--thus, juveniles move rapidly to the Port Heiden area, which has a more abundant food supply--was taken from the OCSEAP synthesis report by Thorsteinson (1984, p. 118). Section III.B.1. describes the range of prey taken by each species during various lifestages and does not imply that food habits are static.

Response 14-31a

This information has been added to the text in Section IV.B.1.a.(1) of the FEIS.

Response 14-31b

Figure III-8 indicates that the second band of pink salmon migrates from the Pribilof Islands northward into Norton Sound. A detailed discussion of the northern band migratory route is not provided because it would be outside the area of expected effects for this lease sale.

Response 14-31b

The text has been amended to reflect this information.

Response 14-31c

This information has been incorporated in the FEIS.

Response 14-31d

Additional information on the distribution of juvenile pollock has been incorporated in the FEIS.

Response 14-32

Available information on location of concentration areas of the various lifestages of groundfish species and biomass estimates has been summarized from current references in Section III.B.1. of the FEIS.

Response 14-33

The North Aleutian Shelf synthesis report (Thorsteinson, 1984) was cited as a summary source of information in the descriptions of capelin and eulachon in Section III.B.1. Refer to these descriptions for other information sources used.

Response 14-34

The reference for information on Pacific cod prey has been corrected in the FEIS. The statement that Pacific cod prey on "sand eels" was taken from Page 100 of NOAA Technical Memorandum NMFS F/AKR-5, by Morris et al. (1983). The term "sand eel" is another name for sand lance.

Response 14-35

In summarizing use of the Bering Sea and, in particular, the North Aleutian Basin by rockfish, Atka mackerel, and sablefish, the DEIS did not state that the North Aleutian Basin was of ". . . great importance." For example, the description of sablefish states, "Although present in the Bering Sea, the greatest abundance of sablefish is in the Gulf of Alaska (Morris et al., 1983)."

Response 14-36a

Section III.B.1. (paragraph 3 on sand lance) acknowledges the importance of Pacific sand lance in the Bering Sea ecosystem, particularly as an important prey species for other fish species, including halibut, coho, and chinook salmon.

Response 14-36b

The text has been amended to indicate that sablefish are abundant only on the slope in the Bering Sea.

Response 14-36c

The text has been amended to reflect this information on yellowfin sole distribution.

Response 14-37

Information on yellowfin-sole harvest levels, and the assessment of potential effects on the commercial catch, can be found in Sections III.C.1. and IV.B.1.a(1), respectively.

Response 14-38

The reference for the statement that the nearshore areas along the Alaska Peninsula are important as a nursery area for yellowfin sole has been corrected in the FEIS. The National Marine Fisheries Service resource report on the St. George Basin, Eastern Bering Sea (1979), states, "The region north of the Alaska Peninsula is important for the young of Pacific halibut, yellowfin sole . . . . Young yellowfin sole were also found in subarea 1, but were apparently restricted to inner shelf waters along the Alaska Peninsula . . . ." This statement was based on the results of the 1975 and 1976 baseline surveys by OCSEAP.

Response 14-39

The biomass estimate provided by NOAA could not be incorporated in the text because the comment did not specify the species involved (of the three species discussed on this page).

Response 14-40

The description of red king crab life history has been expanded to include this and other information.

Response 14-41

The text has been clarified in Section IV.B.1.a.(1) of the FEIS.

Response 14-42

The spelling of Chionoecetes is correct in the FEIS.

Response 14-43

Studies on the distribution of various lifestages of dungeness crab have not been extensive enough to establish that, in the North Aleutian Basin, they are limited specifically to " . . . nearshore in the more rocky substrate habitat present north of Unimak Island."

Response 14-44

While much of the emphasis of this document may be on the North Aleutian Basin lease sale area, the potential effects of any operations in this area will extend well outside the boundaries of this lease sale area. This necessitates the inclusion of information from a much larger area than the lease sale area itself, as well as some general background information. As a practical matter, most studies cover a much greater area than just the lease sale area; and these results are included along with site-specific information.

Response 14-45

All sale-related critical habitats are discussed in detail in Section IV.B.1.b. of the DEIS, including their importance to specific groups of birds. The statement cited is a summary to highlight especially critical areas and is not intended to repeat the preceding detailed discussion. This paragraph has been revised in (see Sec. IV.B.1.a.(2) of the FEIS).

Response 14-46

The text has been amended to address this concern (see Sec. III.B.3 of the FEIS).

Response 14-47

The text has been amended to address this concern (see Sec. III.B. 3 of the FEIS).

Response 14-48

This concern has been noted.

Response 14-49

This typographical error has been corrected to read "subsidiary" in Section III.B.4.a. (Gray Whales) of the FEIS.

Response 14-50

Section III.C.1 of the FEIS has been amended to indicate that the groundfish fishery occurs year-round.

Response 14-51

Figures III-5 through III-10 depict major salmon areas of the northern side of the Alaska Peninsula, by species. Salmon fishing occurs off the major river systems of the northern coast of the Alaska Peninsula, largely in bays and lagoons, but also in open-ocean areas, i.e., the Bear River sockeye fishery.

Response 14-52

The text has been amended to address this concern (see Sec. III.C.1.e.(1) of the FEIS) .

Response 14-53

The text has been amended to address this concern (see Sec. IV.A.1. of the FEIS).

Response 14-54

The resource estimates for Alternative IV have been revised since the publication of the DEIS. The revised estimate shows that Alternative IV has somewhat less oil than the proposal; therefore, fewer projected spills.

Response 14-55

The text has been amended to address this concern (see Sec. IV.3.c. of the FEIS).

Response 14-56

Partitioning of oil is a fate that does not necessarily involve weathering processes. By the statement ". . . altering its [the slick's] chemical and physical characteristics . . ." in the preceding sentence, "aging" obviously is meant in the process-based rather than the time-based sense of the word. Also, the reference to the 10-day timeframe has been clarified in the FEIS.

Response 14-57

In the FEIS the source for Table IV-3 has been reidentified as Manen and Pelto (1984).

Response 14-58

A brief discussion of mousse has been added to the text; and the discussion of oil-spill response has been expanded in Section IV.A.4. of the FEIS.

Response 14-59

The text has been amended to reflect this concern (see Sec. IV.A.5. of the FEIS).

Response 14-60

Weather conditions are not considered a major constraint to offshore oil and gas operations associated with this sale. Technologies are available for operating in the wind and wave conditions that exist in the proposed lease sale area. Much of the threat associated with the local weather conditions can be mitigated by compliance with OCS Orders, the MMS Platform Verification Program, and the MMS Best Available and Safest Technologies (BAST) program. These requirements deal with the assurance that offshore oil and gas operations have a high probability of surviving the environmental conditions of the area.

In cases involving air- and marine-support activities, when severe weather conditions become a threat, operations could be halted until the weather improves.

Response 14-61

The number of exploratory wells is more closely related to economically producible prospects than to total resources. One planning area may have only a few prospects, with few exploratory wells and a high resource estimate. Another basin could have many small prospects, with more exploration wells and a lower resource estimate. The MMS also is constantly revising and updating its geological and geophysical interpretations, which are reflected in subsequent exploration and development schedules.

Response 14-62

Section IV.A.3. of the FEIS includes an oil-spill analysis of the expected number of spills and the probability of 1 or more spills occurring from the transshipment terminal at Balboa Bay, and from the tanker route. Sections IV.B.1.a. and IV.B.1.b. of the FEIS analyze the effects of tankering out of Balboa Bay.

Unga Island mining was included as a major action affecting the North Aleutian Basin Planning Area because this private initiative--in conjunction with development of an LNG plant and trans-

shipment terminal at Balboa Bay--could have cumulative economic and sociocultural effects on the city of Sand Point.

Response 14-63

This typographical error has been corrected in the FEIS.

Response 14-64

These tables from Thorsteinson and Thorsteinson (1982) and Moore and Dwyer (1974) are used as a source of the general ranges of sensitivities of various ecological groups and lifestages. The tables are not used as species-specific LC_{50} values for predicting accurate effects following a known exposure concentration and duration.

Response 14-65

An expanded Section IV.B.1.a.(1) in the FEIS summarizes available information on red king crab, salmon avoidance, herring and capelin, and other topics.

Response 14-66

Table IV-14 summarizes the sublethal as well as lethal sensitivities summarized in Table IV-13; Table IV-13 summarizes lethal concentrations by ecological groups that are not specified in Table IV-14. Information from both of these tables is cited in the analysis.

Response 14-67

The text has been corrected to read "MTL" and original sources have been cited (see Sec. IV.B.1.a.(1) in the FEIS).

Response 14-68

Although a variety of sublethal effects have been observed in various marine organisms following exposure to drilling fluids, only a limited number of marine organisms have been tested and evident effects observed. Both long-term and in vivo aspects have been neglected in investigations of sublethal effects that are generally conducted in controlled laboratory conditions of limited duration and exposure concentrations. For example, the relationship between depth and effects of discharges is not well defined for use in prediction of specific lethal or sublethal effects.

For a summary of available information on this subject, refer to Section IV.F.1 (Effects on Water Quality) and discussions of upper- and lower-discharge plumes, dilution rates, effects at varying depths and distances from discharges, and to a discussion of effects in pelagic, benthic, and nearshore areas in Section IV.B.1.a.(1)(a) and IV.B.1.a.(1)(b).

Response 14-69

This section is organized to discuss (1) toxic effects of drilling fluids, cuttings, and formation waters; (2) effects of increased suspended sediments in the water column; and (3) effects of accumulation of solids on the benthic substrate. Information available on the potential for discharges resulting in mortality from burial or smothering and the relationship of current regimes is discussed in Section IV.B.1.a.(1)(b) (Benthic Habitat); and the relationship of the effect and depth of discharge is discussed in Section IV.B.1.a.(1)(a) (Discharge Effects).

Response 14-70

The discussion of potential effects of chemical dispersants does not imply that dispersants would be used as a cleanup mechanism following an oil spill. This discussion was included to address the State of Alaska's concern regarding potential effects of dispersants on marine biota in the unlikely, but possible, event of dispersant use. It is considered relevant in this EIS because dispersant-use guidelines for Alaska are currently being developed for Alaska through an interagency effort.

Response 14-71

The MMS acknowledges that three main oceanographic domains--coastal, midshelf, and outer shelf--have been identified in the Bering Sea oceanographic literature. However, the use of these categories does not fit the purpose of the generic analysis, "Effects by Habitat Type," presented in this passage. The pelagic, benthic, and nearshore categories were selected because the physical characteristics of these habitats and their locations, relative to project activities, result in a different set of effects on fisheries resources.

Response 14-72

We agree that plankton may metabolize oil. If plankton are contacted by oil in concentrations that exceed the lethal limits, plankton will be killed.

Response 14-73

Information on potential transport of oil to the benthos is presented in Section IV.A.3.d. Additional information on potential effects of sedimented oil on benthic organisms has been incorporated in the FEIS. Section IV.B.1.a.(1) summarizes available information on sedimentation of oil and possible effects on benthic biota, from sources available through 1984.

Response 14-74

The EIS considers waters less than 50 meters in depth to be nearshore areas. The lease sale area includes waters between 30 and 100 meters in depth; however, only a small portion of this area is nearshore habitat (i.e., less than 50 meters).

Response 14-75

The text has been amended to address this concern (see Sec. IV.B.1.a.(1) of the FEIS).

Response 14-76

Incorporation of oil into benthic and beach sediments is discussed in Section IV.B.1.a.(1) (Nearshore Habitats and Benthic Habitats). The effects of elevated hydrocarbon concentrations in nearshore waters are discussed in Section IV.B.1.a.(1) as applicable to various lifestages of each fisheries group (i.e., salmonids, clupeiformes, groundfish, and crabs and other invertebrates), and to the species of major concern.

Response 14-77

The seasonality of migration of the various salmon species is described in Section III.B.1. References are cited which provide more detailed discussions and graphics on salmon movement in the Bering Sea region. General timing of migrations also is provided in this section at a level of detail appropriate to the scope of the analysis of effects presented in Section IV.B.1.a.(1).

The analysis does not go into detail about effects on individual stocks. However, localized effects are identified and analyzed in a broader sense based on assumptions that an oil spill would occur and contact areas of relatively high risk. Discussions of effects on areas or stocks where risks are extremely low or negligible would be misleading. The EIS concludes that even with a large spill (100,000 barrels), only a relatively small number of the total regional population could potentially be affected. The MMS feels that this level of detail is sufficient for the purposes of the EIS.

Concerning delayed migrations, the EIS states that concentrations of oil in the water column following a spill would usually be less than those observed in experimental tests that resulted in avoidance behavior, and that such concentrations should not divert or delay migrating salmon.

A discussion of the variety of effects that could occur from hypothetical oil spills in different habitats and seasons would result in a lengthy academic exercise. In order to focus the analysis, the EIS assumes that a spill would occur and contact areas at risk at a time when vulnerable lifestages are present.

Response 14-78

This paragraph does not imply that discharge dilution is a direct function of distance from land, but rather it reasons that discharges at a minimum of 18 kilometers from land would not be in nearshore waters, which might be shallow or stagnant due to poor circulation that would result in slow dilution. This conclusion is based on the preceding discussions of upper- and lower-discharge plumes, dilution rates, effects at varying depths and distances from discharges, and effects in pelagic and benthic habitats (see Sec. IV.B.1.a.(1)).

Response 14-79

The text has been amended to include an analysis of the effects of pipeline construction and a pipeline spill on salmon streams (see Sec. IV.B.1.a.(1) of the FEIS).

Response 14-80

It is not possible to determine the effects of an oil spill on salmon fry by species and time because it cannot be predicted when an oil spill might occur. The EIS, however, does evaluate the potential effects of oil contacting fry in the nearshore areas. The requested reference for 1 part per million has been added to the text of the FEIS.

Response 14-81

The terms "final" probabilities and "combined" probabilities are both correct (i.e., interchangeable).

Response 14-82

The site-specific analysis is not totally based on the Oil-Spill-Risk Analysis. Data from the OSRA are applied in the analysis to assess risk to fisheries resources; however, the analysis also assesses potential effects in the event of less likely occurrences that are expected for the proposal (i.e., effects of a major oil spill which contacted nearshore areas while vulnerable lifestages

were present). The analysis does not try to predict the time period when an oil spill would occur. The EIS does assume that specific lifestages would be contacted. In this sense, seasonality considerations are taken into account in the analysis. Oil transport and fate are described in Section IV.A.3.d. and are incorporated in the fisheries-resources analysis, as appropriate.

Response 14-83

The use of Unimak Pass by migrating juvenile salmon has been incorporated into the text of the FEIS. Although the potential for delayed migrations or sublethal effects has been acknowledged in Section IV.B.1.a.(1), the purpose of this site-specific analysis is to assess the effects, if any, expected to result from the proposal. Because of the very low probability (0.5% or lower) of an oil spill of 1,000 barrels or greater occurring and subsequently contacting the pass, these effects are not expected.

Response 14-84

In the Port Moller area, significant runs of sockeye salmon occur in the Bear and Sandy Rivers; smaller runs of chum, chinook, and coho occur in these and other streams in the area. In 1984, the North Alaska Peninsula salmon runs totaled 40,000 chinook, 2,500,000 sockeye, and 1,600,000 chum. Totals of 38,000 pink and 197,000 coho were caught in the northern side of the Alaska Peninsula fishery. A statistical summary of salmon catch, escapement, and run size for the Bristol Bay region has been included in the FEIS (Table IV-15). Most of the sockeye were caught by the Nelson Lagoon, Bear River, and Ilnik gillnet fisheries. Bristol Bay sockeye salmon remain some distance offshore until they are 32 to 80 kilometers from their spawning streams (Straty, 1975); hence, they would be able to avoid oil spills contacting the nearshore areas in the vicinity of Port Moller. In 1983, Alaska Peninsula salmon harvests were valued at $30.5 million. Although the precise value of the North Alaska Peninsula salmon harvest is unknown, it probably represents much of the total value of the entire Alaska Peninsula harvest (ADF&G, 1984).

Response 14-85

Seismic activity in the Port Moller area would be limited to that necessary for siting oil and gas pipelines. Approximately 1,360 kilometers of high-resolution seismic survey would be necessary for the 190-kilometer pipeline route. However, only 160 kilometers of high-resolution seismic survey would be nesessary in the Port Moller area.

As indicated in the text, airgun detonations have limited effects and a small potential radius within which effects may be experienced. The information provided in the text substantiates the conclusion that seismic surveys would have a negligible effect on fisheries resources.

Response 14-86

The text has been corrected to read, "Eggs and planktonic larvae . . ." Specific life-history characteristics of each of the four species of clupeiformes discussed have been incorporated into the analysis (i.e., offshore concentration of adult herring at the surface, high natural mortalities of roe and larval herring, consolidation of juvenile herring at the mouths of bays prior to offshore migration, gravel-beach/shallow-shoal spawning of capelin, and anadromous characteristics of boreal smelt and eulachon). Potential effects differ, even among these four species; and although some specific aspects of their life histories and consequent potential effects reflect similarities with aspects of salmon life history, individual analyses have been made.

Response 14-87

The potential for several year-classes of adults being affected has been incorporated into the FEIS. The text also has been corrected regarding the egg/larval year-class. Year-class reductions of larvae and juveniles were acknowledged (along with spawning adults) in the DEIS. The FEIS includes a discussion of the potential effects of hydrocarbons on herring and capelin spawning habitat.

Response 14-88

The reference has been corrected and the 6-day exposure has been noted in the text. The words "natal mortalities" have been changed to "egg mortalities."

Response 14-89

The text has been clarified regarding the timeframe during which herring could be seriously affected. As the comment states, recovery time cannot be predicted. Effects on the commercial herring fishery are addressed in Section III.C.1.

Response 14-90

The text has been amended to address this concern.

Response 14-91

In 1978, the *Amoco Cadiz* spill lost 216,000 tons of crude oil and 4,000 tons of *bunker fuel*, a total of about 30,000 barrels. This

oil spill was widely dispersed offshore along the northwest coast of France for a distance of about 140 kilometers. This spill volume is a great deal more than has ever been lost from U.S. offshore operations oil transport.

The plaice, *Pleuronectes platessa*, were collected from two relatively constricted estuaries, whereas Alaska plaice inhabit the more open and turbulent eastern Bering Sea. Presumably, plaice collected for analysis of the effects of the *Amoco Cadiz* oil spill were adults. These plaice, however, differ from Alaska plaice, *P. quadrituberculatus* Pallas, and also probably are dissimilar in life history, habitat, and food organisms; therefore, comparative analysis is difficult.

Based on analysis of the projected number of oil spills from North Aleutian Basin oil and gas development, estimated volumes, and oil-spill trajectories, contact with Alaska plaice and other flounders is unlikely; if it should occur, adverse effects on the populations would be minor.

Response 14-92

For documentation of the information used in the groundfish analysis, refer to references cited within the analysis and in Section III.B.1 (description of fisheries resources) and Section IV.B.1.-a.(1) (general discussion of effects). Available information has been incorporated in this analysis, and would have been expanded to ". . . include many more references [if they exist] by the commentor . . .," as suggested, had additional pertinent references been noted by the commentor. Information on groundfish-nursery use of the area was taken from the National Marine Fisheries Service report on the St. George Basin, Eastern Bering Sea (1979), in which the information was not presented as speculative, but rather as statements based on survey results.

Response 14-93

Seasonality of groundfish occurrence in the North Aleutian Basin and adjacent waters is summarized in Section III.B.1. Although the analysis does not try to predict the time period when an oil spill would occur, it does assume that vulnerable lifestages would be contacted by oil and assesses the resultant effects in such an event. The EIS acknowledges that most groundfish overwintering occurs in deeper, warmer waters over the slope and shelf break.

Response 14-94

The analysis of effect on red king crab has been separated from the analysis of other invertebrates and expanded. The analysis acknowledges that the red king crab is the invertebrate species most vulnerable to serious oil effects in the event of a spill.

Response 14-95

The analysis of effects on red king crab has been expanded to address this concern.

Response 14-96

Refer to the definitions used in the effects assessment (Table S-2).

Response 14-97

This concern is addressed in Response 1-4.

Response 14-98

Hypothesized reasons for the decline of the Bering Sea red king crab population have been summarized in Section III.B.1. and incorporated in the analysis (Sec. IV.B.1.a.(1)) in the FEIS.

Response 14-99

This concern is addressed in Responses 1-19 and 6-13.

Response 14-100

This concern is addressed in Response 6-14.

Response 14-101

This concern has been noted.

Response 14-102

As stated in Geraci and St. Aubin (1982, p. 48,), "This study was designed to assess the behavior of gray whales migrating in the presence of national oil seeps emanating from the sea floor," and (p. 53) "Typically, the whales would swim through the oil, modifying their swimming speed (Table 4.6 and 4.7) but without a consistent pattern."

Response 14-103

The text does not state that acoustic energy is high (see Sec. IV.B.1.a.(4)). The level of noise above ambient is not as critical as the amount of noise level above the critical-hearing threshold. The whales' hearing threshold may be above the prevailing ambient-noise level by an amount exceeding the critical ratio; therefore, the level of industrial noise would fall below the hearing threshold before it reached the ambient levels. Geraci and St. Aubin

(1980) determined that noise beyond a certain threshold could cause degeneration of cochlear sensory cells. The statement, "Again, a 'high degree of tolerance' as exhibited by avoidance displays may be a poor criteria [sic] to judge tolerance . . ." is without parallel in the text. The MMS is not aware of any data that suggest that avoidance displays are indications of tolerance behavior.

Response 14-104

"Available information indicates that gray whales display a high degree of tolerance to geophysical seismic noise. Extensive geophysical exploration has been conducted off the California coast for more than 35 years . . . .." As stated in the NMFS biological opinion for Sale 73, "Circumstantial evidence indicates that geophysical activities have not precluded the recovery of the eastern Pacific gray whale population . . . .. Concurrent with this recovery has been a rather extensive geophysical exploration of the California coast." As supported by the biological opinion, gray whales have tolerated geophysical exploration off California and, at the same time, have recovered to precommercial-exploration levels.

Response 14-105

This concern has been noted.

Response 14-106

According to the definitions in Table S-2, OCS activities would not have a major effect on right whales because the majority of the population historically use the Gulf of Alaska. Most of the current sightings (from 1935 to the present) have been recorded in the Gulf of Alaska area. The conclusion of minor effects is based primarily on the frequency of a potential right-whale/OCS-activity interaction occurring. No right whales have been observed near the lease area (approximately 2 million hectares) since the one reported in Berzin and Rovnin (1966). The probability of a right whale being in an area of seismic activity would be relatively slight.

The definition of minor effects best describes the potential level of effects on right whales, even for the cumulative scenarios. The MMS bases this decision on the extremely low probability of a right whale being present in the North Aleutian Basin and also interacting with OCS activities. Since the North Pacific right whale population may already be biologically extinct (Braham and Dahlheim, 1981), the effects of an adverse interaction between right whales and OCS activities in the North Aleutian Basin may not affect the regional population, since the few right whales in the North Aleutian Basin might not interact with right whales in other areas.

Although no direct monitoring of seismic testing on right whales has been conducted, extensive data on bowheads does exist. More concise information on bowhead reactions can be found in Section IV.B.1.a.(4), which includes data from Richardson et al. (1984), Fraker et al. (1982), and Reeves et al. (1983). Wursig, who is familiar with both bowhead and right whale ecology and behaviors, stated that these two species exhibit extremely similar behaviors and that, therefore, the behavioral responses of bowhead whales can be extrapolated to right whales. In summary, it is very unusual to find right whales in the North Aleutian Basin; and the probability of a right whale being in a zone of influence from seismic testing would be extremely low. As recommended in the NMFS Biological Opinion, the MMS has developed an ITL and a Notice to Lessees to provide additional protection for the right whale.

Response 14-107

Oil-spill-contact probabilities are for contact to target areas, not to individual species; therefore, contact probabilities would be the same for all species that might occur in a particular target area. An example would be (see Appendix G, Table G-3): a 15-percent probability of oil contacting Resource Area 8, which is used by fin, gray, right, humpback, and sperm whales; Dall's and harbor porpoise; and beluga and killer whales.

Response 14-108

A report by Kent et al. (1983) indicated the following reactions or lack of reactions of migrating gray whales to the presence of oil. These investigators found that greater than 90 percent of the whales observed showed no detectable changes in behavior that could be attributed to the presence of oil. However, in several instances, individual whales were observed to radically change their swim direction when they were about to encounter a surface-oil patch. Kent et al. further indicated that only one-fifth of the population migrated far enough east along the coastline to encounter the dense-oil area. It was speculated that the movement of the migration offshore could well be an adaptive oil-avoidance response reflecting long-term exposure to such seeps by the population. As suggested by this data, gray whales can detect, leave, and avoid an oil-spill area, but the frequency of avoidance behavior has not been developed.

Response 14-109

The "unlikely-interaction" conclusion for the Alaska Peninsula section is supported. Although some of the data may refute other

data, it is necessary to provide the decisionmaker with all pertinent information. Although cetaceans may be in the North Aleutian Basin area all year, chances are good that they don't remain in any one particular area for any length of time. Therefore, actual exposure rates and probabilities of an oil-spill/cetacean interaction may be lower. The probability of spills coming in contact with cetaceans or their habitats within the North Aleutian Basin area is generally less than 0.5 percent. Based on the cetaceans' broad distribution, relatively mobile population, and the recent data on direct and indirect effects of hydrocarbon pollution on cetaceans (Geraci and St. Aubin, 1982), their populations are unlikely to be affected by spilled oil.

During the summer feeding season, interaction of nonendangered cetaceans or their habitat with oil spills originating in the North Aleutian Basin is generally very unlikely (less than or equal to 10%).

Direct oil-spill consequences to zooplankton or other cetacean-food sources are considered to minimally affect summer feeding cetaceans due to the zooplanktons' rapid fecundity and the secondary food source they provide to most nonendangered cetaceans.

If development of hydrocarbon resources occurs to the extent estimated (see Sec. IV.A.1.), and if associated spill rates occur (see Sec. IV.A.3.), there exists a generally low probability of oil contacting nonendangered cetaceans or their habitats. Since most nonendangered cetacean species are not present in the area at all times, and given the assumptions of the oil-spill-trajectory model, the absolute probability of direct effects on cetaceans would be lower. Therefore, significant adverse oil-spill/cetacean interaction from development of hydrocarbon resources within the lease area is unlikely.

Response 14-110

The text has been amended to address this concern (see Sec. IV.B.1.b.(1).

Response 14-111

Spill-point location can be found in Table G-1, Appendix G; however, spill points have been added to the text of the FEIS for clarification. There are no time periods associated with spill-launch points--only targets (see Sec. IV.B.1.a.(4)).

Response 14-111a

Resource estimates for Alternative IV have been revised since the publication of the draft EIS. Alternative IV has a conditional mean estimate for undiscovered recoverable resources of 331 MMbbls of oil and 2.20 TCF of gas (Table II-1). This alternative reduces the size of the area, resource estimates, and level of activity compared to Alternative I.

Response 14-112

Launch points have been included in the text for clarification (see Sec. IV.B.1.a.(4) of the FEIS).

Response 14-113

The title of this section is accurate.

Response 14-114

The text has been modified to indicate that 1 spill of 1,000 barrels or greater is projected for Alternative IV (see Sec. IV.F.1.b. of the FEIS).

Response 14-115

Gray whales are present in the nearshore areas, adjacent to the lease area, from March through December; but the highest number of individuals is observed during the spring (March-June) and fall (October-December) migration periods. The effects from unavoidable adverse effects cannot be greater than those effects associated with the proposal. Of the species observed in the area, only the bowhead whale has a depleted stock size. Most effects that pose potentially harmful situations for endangered species can be protected, either through mitigating measures or through laws already in existence (i.e., the Marine Mammal Protection Act and the Endangered Species Act).

Response 14-116

The EIS does not state that there will be a loss of individual endangered species, but rather, "Such effects may lead to long-term loss of individual endangered species . . . ." "Long-term loss of individuals" best fits the description of minor effects in Table S-2. Because most endangered whales appear to be increasing their numbers since full protection began, small losses to a recovery population should not affect a population overall. The gray whale is an excellent example of how the loss of individuals (169 taken annually by Soviet whalers under permit) does not have catastrophic effects on the population.

Response 14-117

The page numbers in Appendix J have been corrected.

Response 14-118

The MMS disagrees that the maximum case should be used in the worst-case analysis. The two analyses are designed for different purposes. The maximum case assesses effects over the life of the project based on a large resource estimate. In order to ensure compliance with CEQ Regulations, the worst-case scenario analyzes the effects of a catastrophic event, i.e., a major oil spill. For example, both cases are based on the same resource extimates (759 MMbbls) and the same number of production platforms. The EIS has been amended to include a worst-case analysis for a 100,000-barrel oil spill; this case includes analyses of all biological resources (Sec. IV.J. of the FEIS).

Response 14-119

One of the functions of a NEPA document is to indicate the extent to which environmental effects are essentially unknown. Under the NEPA, the basic responsibility of an agency is to predict the environmental effects of a proposed action before the action is taken and those effects are fully known. Therefore, reasonable predictions and speculation are implicit in the NEPA.

Response 14-120

This concern is addressed in Response 14-119.

Response 14-121

The text in Section VI of the FEIS (Consultation and Coordination) has been revised as follows:

> In August 1983, the Department of the Interior announced the selection of the entire North Aleutian Basin Planning Area for environmental analysis and study in the EIS (13.1 million hectares or 32.5 million acres). However, as a result of the Secretary's consultation with the Governor of Alaska, the area to be studied was reduced to approximately 2.27 million hectares (5.6 million acres), consisting of 990 blocks (Graph- ic 1). This area, representing approximately 17 percent of the planning area, has been analyzed in this EIS.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

15

APR 2 1985

OFFICE OF
EXTERNAL AFFAIRS

Mr. William Bettenberg
Director
Minerals Management Service
Department of the Interior
Washington, D.C. 20240

Dear Mr. Bettenberg:

The Environmental Protection Agency (EPA), in accordance with its responsibilities under the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act, has reviewed the draft environmental impact statement (DEIS) for the proposed Outer Continental Shelf (OCS) Oil and Gas Lease Sale # 92 in the North Aleutian Basin.

The proposed lease sale encompasses approximately 5.6 million acres ranging from 11 miles to 114 miles offshore, in water depths from 30 to about 100 meters. The sale is tentatively scheduled for December, 1985. In addition to the proposed action (Alternative I), the DEIS presents three other alternatives, including No Sale, Delay the Sale, and the Alaska Peninsula Deferral (Alternative IV), which would delete all blocks within 40 kilometers (25 miles) of shore, or about 13% of the proposed sale area.

15-1 EPA's major concern stems from our belief that the DEIS does not provide a sufficient basis for configuring the lease sale in a way that would allow oil and gas development to proceed in an environmentally acceptable manner. We believe that the DEIS' analysis of the impacts of oil and gas development, particularly the risks of oil spills, is generally inadequate for framing leasing alternatives in the North Aleutian Basin, and does not fully make a case for selection of either Alternative I or Alternative IV.

15-2 If MMS decides to proceed with the sale, we believe the DEIS should be revised and the lease sale reconfigured to provide for a careful and conservative entry into this frontier area. In particular, we believe the Alaska Peninsula Deferral alternative should be redesigned to provide an adequate buffer zone to protect the critical biological corridor just north of the Alaska Peninsula.

In light of the biological importance of the area, however, we believe the environmentally preferable alternative is Delay of Sale. The Southern Bering Sea and Bristol Bay are among the most biologically prolific marine areas in the United States and the world. Delay of Sale would provide industry more time to gain experience in other Alaskan OCS lease sale areas, perhaps lessening the risks that eventual oil and gas development may pose to the marine resources of the North Aleutian Basin. Our letter addresses our concerns with the current Alternative IV, and summarizes the enclosed detailed comments. Finally, the letter outlines the relation between oil spill risks and EPA's responsibilities under NEPA for issuing permits to cover oil and gas discharges.

ADEQUACY OF DEIS FOR LEASE SALE CONFIGURATION

The biological importance of the estuaries and coastal lands on the north side of the Alaska Peninsula and the nearshore waters adjacent to the Peninsula and extending into the southern portion of the proposed lease area are illustrated extensively in the DEIS. Many spawning streams for sockeye, chum, and coho salmon are located along the north side of the Alaska Peninsula (Figures III-4, III-8, III-9). Juvenile salmon spend their rapid growth period in nearshore waters (p. III-B-2). Pacific herring spawn in shallow coastal waters (Figure III-10; p. III-B-6). Halibut migrate along the northern side of the Alaska Peninsula (p. III-B-12). Larval king and tanner crabs are concentrated in this area (Figure III-11). The nearshore waters, estuaries and coastal lands of the area are very important to waterfowl for nesting, molting, staging for migration, and overwintering (Graphic 2; p.II-B-22). Sea otters occur in medium to high densities in the vicinity of Unimak Island, Izembek Lagoon and Port Moller (Graphic 3). The endangered Gray Whale migrates along the Peninsula coast, and Izembek Lagoon and Port Moller are areas of frequent summer use (Graphic 4), where 10% of the population feeds (p. IV-E-4).

15-3 Because of the importance of these nearshore waters, MMS should consider further deletion of lease tracts from the southern portion of the proposed lease area. Although the Alaska Peninsula Deferral eliminates tracts within 40 kilometers of the Peninsula, it is not totally clear that it provides sufficient protection from oil spills for the biological activities of nearshore waters. For example, the DEIS states (p. IV-E-1) that the choice of Alternative IV would reduce the conditional probability of an oil spill contacting the resource area around Port Moller within 10 days from 99.5% to 49%. Yet it is clear from Table G-2 that moving the southern boundary of the lease sale somewhat further out (thus eliminating launch points 82 and 83) would further reduce the probability of a spill contacting the Port Moller area to practically zero, according to the MMS model.
15-4 The DEIS also states (p. I-D-6,7) that the sale incorporates a deferral of tracts less than 70 meters in depth, as requested by the U.S. Fish and Wildlife Service. The depths of the tracts in the proposed sale area, however, are described as ranging from 30-100 meters (p. II-B-1). We believe that appropriate initial steps in redesign of Alternative IV

would involve reconsideration of the southern boundary of the lease sale to eliminate areas less than 70 meters in depth and those areas wherein the conditional probability of contacting land or resource areas would be significant. Finally, the state-of-the-art in oil spill containment and clean-up is a compelling reason for redesigning Alternative IV to provide a buffer zone north of the Alaska Peninsula. Because of severe weather and sea state conditions typical of the area, little containment or clean-up of large oil spills is likely. If Alternative IV is to present a substantive difference from the proposed alternative, it must provide for a meaningful buffer zone protecting the biological uses of the Alaska Peninsula.

15-5 The DEIS is not clear what the choice of Alternative IV, as it is currently designed, would mean for oil and gas resources. Table II-1 indicates that no oil and gas resources would be foregone if Alternative IV is chosen. (If that is the case, it is the obvious choice over Alternative I). But Table IV-8 suggests that the elimination of approximately 13% of tracts proposed in Alternative IV would reduce the mean resource estimate by about one-third. The trade-off between oil and gas resources and environmental harm avoided between the existing Alternatives and a redesigned Alternative IV should be clearly established in any revised EIS.

SUMMARY OF DETAILED COMMENTS

Our detailed comments are directed to the adequacy of the DEIS. We have attempted to point out how the information base for designing a sale configuration may be strengthened so as to balance the potential oil and gas resources against the risks from exploration, development, and production in a frontier area of high biological productivity and importance. Major issues covered in EPA's detailed comments are described briefly below:

15-6 -- The detailed comments provide numerous instances of information that should be, but is not, adequately considered in the DEIS. These information gaps, in the aggregate, weaken the conclusions drawn regarding the environmental consequences described in the DEIS, particularly with regard to oil spill effects.

15-7 -- The descriptors (MAJOR, MODERATE, MINOR, NEGLIGIBLE) used in assessing effects in the DEIS are applied in a way that we believe systematically understates the impacts (1) by "averaging" the descriptors for a variety of different actions to arrive at an overall effect (e.g., the effects of seismic activities, drilling discharges, and oil spills are somehow aggregated to provide an overall effect), and (2) by "averaging" the effects, and their descriptors, over species.

15-8 -- The DEIS does not adequately consider indirect impacts on higher trophic levels resulting from the loss of key prey species or their habitats. For example, it often notes that spills would only affect a species if it were present during the time of the spill, without adequate consideration of the effects of spilled oil on prey organisms.

15-9 -- Although it is the postulated site for the LNG plant and the transshipment terminal and is an area of concentrated tanker traffic, the shores and waters of the south side of the Alaska Peninsula are not adequately discussed in the DEIS. In particular, no trajectory modeling was done for spill sources south of the Alaska Peninsula.

-- In a separate report, transmitted to MMS on February 12, EPA raised issues regarding the oil spill risk and oil spill trajectory models used in this DEIS. Although correspondence between MMS and EPA staff have addressed many of those issues, some concerns about the application of the model still need to be discussed.

NPDES PERMIT ISSUANCE UNDER NEPA

EPA's interest in the configuration of the North Aleutian Basin lease sale stems, in part, from our statutory responsibilities to issue National Pollutant Discharge Elimination System (NPDES) permits for discharges from OCS oil and gas operations. Once EPA promulgates New Source Performance Standards (NSPS) for offshore oil and gas discharges, those responsibilities could be considerably expanded by EPA's need to comply with NEPA in issuing permits to "new sources" (those dischargers covered under NSPS). Where NEPA applies, EPA must consider not only the effects of the permitted discharges on marine biota and water quality, but the broader scope of environmental concerns evaluated in a NEPA review. Thus, in making a permit decision to which NEPA applies, the Agency may consider the risk of oil spills in deciding whether to condition or deny a NPDES permit in specific areas. For the North Aleutian Basin, the vast majority of permitting for exploration, development, and production is likely to occur after NSPS are promulgated. (NSPS for oil and gas point sources are expected to be proposed this spring; promulgation will probably occur in late 1986). Accordingly, the risk of oil spills may be a factor considered by EPA in the issuance of any NPDES permits, general or individual, to "new sources".

15-10 EPA has rated the action proposed in the DEIS "EO-3" (Environmental Objections-Inadequate). (A sheet describing EPA's rating system is enclosed for your information). The "3", or Inadequate, rating is based on EPA's assessment that the analysis in the DEIS does not provide a sufficient basis for designing a lease sale configuration that balances

the oil and gas resource potential of the North Aleutian Basin against the important biological resources of the area. In particular, the analytical basis for evaluating the effects of oil spills should be strengthened, so that oil spill modeling results can be effectively and reliably used to aid in configuring the sale.

On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the Council on Environmental Quality (CEQ). MMS should be aware, however, that a revised EIS may indicate to EPA that the revised action alternatives also pose too many risks to be environmentally acceptable. Thus, a revised proposal may also be a candidate for referral to CEQ.

We appreciate the extra time provided us by MMS to complete the review of this DEIS. The time extension was, in part, predicated on scheduling a meeting to discuss the EPA contractor report on the MMS oil spill risk model and trajectory analysis used both in this DEIS and in the St. George DEIS (Sale #89). Although that meeting could not be scheduled prior to submitting our comments on this DEIS, we appreciate the excellent cooperation and response of the MMS staff in working with us to resolve our concerns with the model. We still anticipate meeting with MMS to continue these discussions. If that meeting provides us with other information that bears on our review of the North Aleutian Basin DEIS, we will provide you with follow-up comments.

Given the scope of our comments, and our interest in providing an analysis that is suitable for EPA decision-making on NPDES permits, we would be willing to work with the MMS Alaska staff during the development of a revised DEIS. We also believe it would be productive to have an early meeting to address any preliminary questions you may have about our comments and concerns, and we will contact MMS staff to arrange this meeting. In the interim, questions concerning our comments may be addressed to Armand Lepage of my staff (382-5049), or Marcia Lagerloef of our Region X office (FTS-399-1265).

Sincerely,

for [signature], Acting Director
Allan Hirsch, Director
Office of Federal Activities

Enclosures

U.S. ENVIRONMENTAL PROTECTION AGENCY

Draft Environmental Impact Statement

NORTH ALEUTIAN BASIN SALE 92

Review Report

March 1985

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CHAPTER 1 INTRODUCTION

This report presents the detailed comments of the U.S. Environmental Protection Agency (EPA) on the Draft Environmental Impact Statement (Draft EIS or DEIS hereafter) for the Minerals Management Services (MMS) proposed Outer Continental Shelf (OCS) Lease Sale # 92 (North Aleutian Basin). Because of the high value of the biological resources in the North Aleutian Basin and the Southern Bering Sea, EPA has done a substantially more thorough review of this Draft EIS than has been our practice with prior EISs for Alaskan OCS lease offerings. After the Introduction, the report discusses our concerns with the Draft EIS' evaluation of environmental consequences. It then discusses our concerns with the remaining chapters of the DEIS. The last major chapter contains a lengthy amalgamation of recommended technical corrections and changes to the text of the DEIS. These comments and questions are advisory only, and EPA does not expect explicit (point-by-point) responses to these technical suggestions. Finally, we had the benefit of seeing MMS' responses to our comments on the Draft EIS for proposed lease sale # 89 (St. George Basin). Therefore, where appropriate, these detailed comments account for those responses.

CHAPTER 2 ENVIRONMENTAL CONSEQUENCES ANALYSIS

2.1 Introduction

This chapter provides EPA's major comments on the Draft EIS' evaluation of environmental consequences. It focuses on the significant issues associated with how the analyses were conducted and how the EIS arrives at conclusions regarding the magnitude and significance of the potential impacts.

2.2 Oil Spill Risk Analysis

2.2.1 OSRA Technical Problems

The Oil Spill Risk Analysis (OSRA) includes an estimate of the probability of one more more spills occurring (a risk analysis per se) and an evaluation of where spilled oil might move (the trajectory analysis). Over the past few months, EPA has completed a detailed review of the OSRA which MMS developed for the proposed St. George Basin lease offering (Sale #89) and the North Aleutian Basin lease offering (Sale #92).

These results were conveyed to MMS on February 12, 1985. EPA and MMS staffs were unable to meet to discuss these issues and we have not, therefore, provided any detailed comments on the OSRA in this DEIS review. We intend to meet with MMS staff soon in order to discuss the technical issues associated with the review and the results, and begin discussions on the scope, content, and timing of any required changes. Following that meeting, we intend to provide you with follow-up comments, if appropriate, on the application of the OSRA to this DEIS.

2.2.2 Other OSRA Considerations

2.2.2.1 General Comments

15-11 No oil spill trajectory calculations were made for the southern side of the Alaska Peninsula; however, a major port for tanker loading is proposed in Balboa Bay. Consequently, the risks due to tankers entering and exiting the port have not been considered. The revised risk analysis should include launch points from these tanker routes.

15-12 The cumulative case scenario for the Sale 92 DEIS appears to be different from the cumulative case scenario described in the Sale 89 DEIS. If these scenarios are different, then the differences should be noted and explained and the consequences described.

15-13 Estimates of production from other lease areas in the Bering Sea have been changed since EISs were prepared for these lease sales. In the case of the St. George Basin Sale 89, for example, the increase in estimated recoverable oil has been significant. The revised Draft EIS' analyses should reflect these changed resource estimates.

2.2.2.2 Major Specific Comments

15-14 The EIS should note, on page IV-A-7, that anchor dragging is the single most important cause of pipeline spills. No discussion exists in the DEIS concerning anchoring in the North Aleutian Basin, particularly in Port Moller. Port Moller is frequently used as shelter by vessels during storms. Most pipelines in the Gulf of Mexico are small and transport oil to nearby shore stations. This may not be the case in the North Aleutian Basin, where pipelines may traverse long distances in regions of extensive and intensive commercial fishing.

15-15 The comparison, on page IV-A-8, of oil spill predictions would be more meaningful if compared with experience in the North Sea. Neither Prudhoe Bay nor Cook Inlet oil production occurs in the harsh offshore marine environment of the North Aleutian Basin. Using the Alaskan record, however, is probably as good as, if not better than the Gulf of Mexico record. Unfortunately, the DEIS does not show how the projected values in Table IV-7 were derived. Through 1983, total state offshore production in Alaska was 0.8 BBbl. Thus, for Cook Inlet data in Table IV-7, only the projected value for pipelines matches the rates stated in Table IV-6. Similar questions must be raised for Prudhoe Bay projections. Pipeline spills associated with Prudhoe Bay are not reasonably comparable to offshore activities because they are not exposed to the major cause of offshore pipeline spills (anchoring).

In view of the difficulties of loading oil directly to tankers in the marine environment of the North Aleutian Basin, pipelines are probably the most reasonable mode of transport.

2.2.2.3 Cumulative Effects Assessment Assumptions

15-16 The DEIS does not consider trajectories of oil spills arising from spills in and south of Unimak Pass. However, 2 (1.78) of 14 (13.69) spills are anticipated between Balboa Bay and southern markets. The fate of oil spilled south of the Alaska Peninsula should be considered in the cumulative impacts assessment. On page III-C-4 the EIS states that "More fish are harvested on the southern side of the peninsula than on the northern (Fig. III-19), and the species composition of the catches of these two areas is quite different".

2.3 Derivation of Impact Conclusions

2.3.1 Trophic Structure Impacts

15-17 The DEIS does not adequately consider indirect impacts on higher trophic levels resulting from loss of key prey species. It frequently notes that fish, birds, and mammals would be affected by an oil spill only if it occurred when these organisms were present. We believe the EIS should place more emphasis on the indirect impacts of losses of food sources. The Bering Sea supports abundant fish and wildlife resources because of rich food sources, but even localized losses of food supplies may have significant effects on certain species. The walrus population, for example, is already considered to be limited by food supplies. Many of the marine birds have low reproductive rates, and losses of food supplies near nesting colonies is a potentially significant impact. Oils found in mudflat sediments may persist and be toxic for long periods of time. As a result, herring spawning and epibenthic prey species for salmonid juveniles may be disrupted. Tar balls persist for long periods of time and could disrupt foraging patterns of benthic feeders such as gray whales or walruses. The EIS should not generally assume that alternative feeding habitat is available when a class of organisms' normal feeding habitat is disrupted or damaged by OCS oil and gas activities.

2.3.2 Impact Averaging

The DEIS' practice of summarizing the magnitude of impact (e.g., MINOR, MODERATE, MAJOR) as if it were a mathematical "mean" of the impacts posed by different activities tends to understate the impacts. For example, the DEIS may find that seismic activity may have NEGLIGIBLE effects, drilling discharges may have MINOR effects, and oil spills may have MODERATE effects on a particular fish resource, but "overall" the effect is considered MINOR. This approach implies a process in which the magnitudes of various impacts are somehow weighted by their probability of occurrence and summed in order to arrive at an estimate of the cumulative impact on the specific resource. We question whether such a cumulative
15-18 estmate is useful in describing impacts.

The DEIS also summarizes the impacts over several different species. A good example is found on p. IV-B-35 where it notes that a major oil spill could have a MAJOR impact on red king crabs, but "overall" the impact would be MINOR on regional populations of crabs and other invertebrates. Thus, serious impacts are obscured by the DEIS. We believe this kind of "overall" measure also understates impacts on individual species.

Thus, the DEIS averages the combined effects of various sources of impacts and it averages impacts across species. It also averages in a third way in that it often determines the impacts would be MINOR based on the fact that only a small portion of a regional population would be affected, ignoring that the regional population is very large and that a small portion can be a very large impact in absolute terms. These practices tend to understate the significance of the impacts. By doing so they can mislead decision makers attempting to use the EIS and result in decisions which do not provide an adequate degree of environmental protection.

2.3.3 Impact Significance Derivation

As we understand the analytical process used in developing the EIS'
15-19 conclusions regarding the significance of the impacts, the final element considered by the staff specialists in determining whether the impacts

would or could be NEGLIGIBLE, MINOR, MODERATE, or MAJOR is the probability of the impact's occurrence. Thus, if an impact has a low probability of occurrence, it is likely that it will be classed as NEGLIGIBLE or MINOR in the EIS. Similarly, the text often and erroneously links "effect" and "probability." If the probability of spill occurrence is low, it does not logically follow that the effect of a spill will be negligible. It merely means that the likelihood of an effect occurring is low. If an effect does occur, it could be quite significant, depending on conditions (see p. IV-B-74, para. 3 for example). Finally, this practice of dismissing most potential impacts as being minor or negligible due to their low probability of occurrence impairs the ability of decision makers and the public to make objective judgments on the acceptability of the risks and impacts associated with the proposed action.

We believe the presentation of the effects and impacts of OCS operations could be more clearly presented in this and subsequent EISs if the effects and their probabilities of occurrence were treated separately. Thus, a more appropriate approach would:

A. Describe the environmental effects, their potential scope (how wide-ranging they might be), and their potential magnitudes (quantify them where possible).

B. Reach its assessment of their significance (major, moderate, minor, negligible) based on this analysis.

C. Then provide an assessment of the probabi'ity of the effect's occurrence. That probability assessment would include an assessment of the uncertainties associated with the predictions (such as error bands or confidence intervals on the quantitative risk estimates).

The assessment of these risks would form the basis for determining what steps need be taken to reduce or eliminate unacceptable risk levels. Although we recognize that this is the process that MMS attempts to follow, we believe that, as described in the preceding paragraphs, the method of presentation ("weighting" various sources of impacts by probability and summing over a resoource; "averaging" impacts over species) blurs the distinctions between effects and their probabilities of occurrence. The nature of the presentation of effects and risks is important for allowing decision makers and the public to reach their own judgments on whether the potential risks would be acceptable, particularly when the biological resources at risk are as valuable as those of the North Aleutian Basin and the Southern Bering Sea.

2.4 Development Infrastructure Impacts

The Draft EIS provides only brief analyses of the potential impacts
15-20 of the infrastructure and capital facilities necessary for the development of oil and gas resources, if they are found. We believe that a screening

level analysis of these potential impacts is essential at this stage. The objective of this effort would be to determine whether the required development infrastructure (pipelines, port facilities, oil transhipment facilities, and the LNG plant) could result in unacceptable adverse environmental consequences. If any of the screening level analyses show such a potential, then the EIS should discuss other development scenarios or measures that need to be examined to mitigate the impacts.

2.5 Water Quality

2.5.1 General Comments

The DEIS concludes that exploration phase drilling effluent discharges will not result in any significant water quality on biological impacts. This analysis is lacking in several respects.

15-21 The discussion of effluent discharges omits mention of test fluids, desalination unit discharge, deck drainage, bilge water, blowout preventer fluid, cement, and non-contact cooling water. Although relatively minor in volume, components of these discharges could be toxic. Therefore, their existence, quantities, and composition should be included in the discussion of potential impacts.

15-22 The EIS should discuss potential water quality impacts from LNG terminal construction at Balboa Bay or construction and operation of the pipeline through Port Moller and across the Alaska Peninsula. The potential water quality impacts of these facilities should be evaluated in a screening level analysis.

The construction activity of major concern is the pipeline to Port Moller and Herendeen Bay and across the Alaskan Peninsula to Balboa Bay. Although episodic turbidity may be a natural phenomenon, it should not be assumed that sustained turbidity resulting from pipeline construction is therefore insignificant. Particular attention should be given to the effects of pipeline construction on red king crab populations and the biota of Port Moller and Herendeen Bay. The DEIS should provide a clearer picture of the effects of turbidity in the vicinity of active pipeline construction operations. For example: what is the maximum linear dimension of bottom disruption at any one time, and given current conditions, what is the spatial magnitude of elevated turbidity associated with this disruption? What engineering techniques could be used to reduce the impact of construction?

2.5.2 NPDES and ODCE Requirements

15-23 The DEIS should note that EPA has already conducted a preliminary analysis of discharges associated with exploratory drilling. However, the DEIS should discuss in more detail the magnitude and significance of development and production discharges and construction activities; EPA has not yet conducted these analyses. As MMS noted in the Final EIS for the recently deferred Gulf of Alaska/Cook Inlet Lease Offering, a basic analysis of these potential impacts must be included in a lease offering EIS in order to comply with the appropriate parts of 40 CFR Part 1500.

Based on an independent review of the adequacy of existing data to support EPA permitting activities in the Alaskan OCS [JRB, 1984] and a preliminary ODCE for this lease sale [Jones & Stokes, 1984], we have identified additional information that is needed for an adequate assessment of the fate and effects of effluent discharges and impacts resulting from development and production phase activities. Such an assessment would be required to support issuance of National Pollutant Discharge Elimination System (NPDES) permits for development and production phase discharges under section 402 of the Clean Water Act (CWA). The revised Draft EIS should note the information needed to evaluate potential impacts of discharges, some of which is described below.

Because there is little mean circulation in portions of the lease sale area, water masses and associated materials tend to have long residence times. The potential for impact on the water column is high in this planning area due to the above mentioned transport characteristics. Information on sensitive meroplankton, especially their spatial coverage, is needed. The development phase poses a threat to benthos, either directly from burial or indirectly through cumulative toxicological or food chain effects. Knowledge of chronic toxicity of drilling muds and produced water, particularly bioavailability, bioaccumulation and biomagnification is limited [JRB, 1984; Jones and Stokes, 1984]. Few laboratory or field studies have addressed chronic exposure to sublethal concentrations [Jones and Stokes, 1984], and Alaskan species form a small subset of the data base.

15-24 Bioaccumulation of heavy metals such as mercury, cadmium, and barium present in drilling muds and cuttings, are of concern. It appears that bioaccumulation during exploratory drilling is not a significant concern because of the limited volumes of drilling muds and cuttings to be discharged. In contrast, development drilling could result in the discharge and deposition of substantial quantities of drilling mud.

Although operational recycling of drilling muds during development drilling may reduce the volume of muds discharged per well, total quantities could still increase significantly. The St. George Basin (Sale # 89) Final EIS assumes approximately 90% recycling of drilling muds. However, EPA does not have any data which support such a high recycling rate. The development of the Endicott Reservoir (an oil bearing formation in the same size range as that which the mean case development scenario contemplates, with similar reservoir depths) will require substantially more wells (120). Our evaluation of that operation, based on data submitted by the permit applicant, suggests a much lower, but unquantified, recycling rate. Thus, at this stage in the NEPA evaluation, we believe EPA and MMS are obligated to take a conservative approach to estimating the potential impacts of development and production phase drilling effluent discharges. This suggests that the leasing decision EIS should use a high-side estimate of the quantity of materials discharged.

Although recent reports suggest that under normal operating conditions most detectable adverse effects from discharged drilling fluids should be limited to within several hundred meters of the point of discharge, they go on to point out that possible exceptions to this generalization could occur when drilling conditions differ from normal or when drilling rigs are located near sensitive biological areas, or in poorly flushed areas [EPA, 1984], [NRC, 1983]. Since portions of the North Aleutian Planning Area have very low current velocities, drilling muds may accumulate and persist in the Basin. Thus, potential human impacts stemming from ingestion of contaminated seafood must be addressed in our development phase ODCE under section 403 of the CWA. For
production phase operations, the produced (formation) waters need to be
characterized. Produced waters are mentioned in several places in the
DEIS, but no indication of the likely physical and chemical
characteristics is provided. Understandably, these characteristics will
vary significantly depending on the oil bearing formation from which the
15-25 water comes. However, a range of values, for various physical and
chemical parameters, based on produced waters from developed fields in the
OCS and in state waters would orovide useful information. A good summary
of the data, as well as a summary of current toxicity information, can be
found in our ODCE for Gulf of Alaska and Cook Inlet (Sale #88). [Jones &
Stokes, 1984b].

Additionally, the dispersion characteristics of produced waters need
better definition. If future study indicates a likelihood of flocculation
or particle cohesion, then impacts on benthos will need to be reevaluated.
If produced water particulates will be primarily fines characterized by
15-26 low sinking velocities, then the primary impacts would be to water column
species. In general, produced water and its components are not
characterized by high acute toxicity; however, since meroplankton is known
for its sensitivity, knowledge of its distribution and seasonal abundance
in the lease area will be of major importance [JRB, 1984].

Finally, there is inadequate information on the complex ecosystem
dynamics in the lease sale area. More data are needed to provide a more
15-27 thorough understanding of the ecologically important species and food
chain associations. This understanding is necessary to evaluate the
impacts from development and production discharges (as well as accidental
oil spills).

Based on these considerations, we suggest that Table S-1, Summary of
Effects for Alternatives I, III, IV, be clarified to note that MINOR water
15-28 quality impacts are for the exploration phase only. EPA does not find
adequate data presented in the DEIS to substantiate a "Minor" level of
effect for the development and production phases.

2.6 Air Quality

2.6.1 General Comments

The "Effects on Air Quality" section consistently refers to "nitrous oxides" instead of using the appropriate terms "nitrogen oxides" or "oxides of nitrogen" when discussing combined emissions of nitric oxide (NO) and nitrogen dioxide (NO_2).

Nitrous oxide (N_2O) is one of the more abundant naturally-occurring
trace components of the atmosphere. It is one of the significant gaseous
15-29 products of bacterial denitrification processes. Nitrous oxide is rather
stable chemically and is of little concern from an air pollution
standpoint. Nitric oxide is a product of high temperature combustion, is
chemically reactive and is a major source of nitrogen dioxide. Nitrogen
dioxide has a major role in the atmospheric chemistry of photochemical
smog and acid precipitation, and is sufficiently toxic to animals and
plants to warrant an ambient air quality standard.

We suggest that the Revised Draft EIS discuss alternatives to burning
oil spills. Burning, at least in the short term, adversely affects air
15-30 quality. The potential for and effects of cumulative particulate fallout
on snow cover should also be addressed.

2.6.2 Major Specific Comments

The DEIS does not present sufficient information to support the
15-31 conclusion that there will be no violation of Federal or state ambient air
quality standards or Federal PSD requirements.

The criteria used in Table S-2 for categorizing air quality impacts as
MINOR vs MODERATE should be revised to characterize long term localized
violations of air quality standards as a MODERATE impact. Geographic
scale (local vs areawide or regional) is an inappropriate criterion for
15-32 characterizing certain types of impacts as MINOR vs MODERATE. This is
particularly true for air quality (and perhaps water quality) issues.
Long term local violations of air quality standards (MINOR impact
according to Table S-2) would be a serious violation of Clean Air Act
requirements, and in some situations could involve a serious public health
impact.

2.7 LNG Risk Analysis

The Draft EIS does not contain any risk analysis for the postulated
LNG plant or the LNG tankering operation. A typical risk analysis, such
as that found in EISs prepared by the Federal Energy Regulatory Commission
15-33 for similar facilities, evaluates the potential for accidents that could
result in a large liquified natural gas release. After doing this
probability analysis, the evaluation examines the fate of the released gas
through dispersion modeling. This modeling helps determine how many

people might be affected by the gas and how large an area might be affected by a fire if the gas ignites.

Although this type of evaluation would normally be done at the development or production phase of the project, we believe an earlier analysis is appropriate in this instance. The Alaskan Peninsula, as documented in the EISs which MMS has released on lease offerings for the St. George Basin, is an area of especially high seismic risk. It may be very difficult, perhaps impossible, with the current state of the art to design and construct LNG facilities in that environment which provide an adequate degree of protection to the public. Thus, at least a screen level risk and impact analysis should be contained in the Revised Draft EIS.

2.8 Fisheries

2.8.1 General Comments

15-34 Although the DEIS adequately considers effects of the lease sale on different groups of harvested species and invertebrates, it does not address the impacts on food webs and non-harvested invertebrates. This oversight is particularly critical in the nearshore environment because: 1) many of the harvested and vertebrate species have critical uses of the nearshore area, and 2) oil spills would have the greatest adverse impact on the nearshore habitat.

Many of the species discussed in the DEIS forage in the nearshore zone at certain times. Although the DEIS assumes that no impact would result if an oil spill occurred at any other time of the year, oil spills that impinge on the nearshore areas could significantly alter food webs. On p. IV-B-31 it is correctly stated that ". . . oil may remain toxic in sediments over a long period . . ."

15-35 The DEIS assumes that a 200 square km area of impact represents only a localized impact zone compared to the North Aleutian Basin. In several places the EIS notes that a 100,000 bbl spill might spread to cover 200 square km; however, slicks will be transported by wind-driven surface currents and will eventually travel over an area much greater than 200 square km in a relatively short time. More critical, however, is the fact that some fish resources may be highly concentrated in a particular area during certain seasons or life-history stages.

15-36 The finding of MINOR or MODERATE impact within the text summary in several instances is misleading in conjunction with the statement that the protection of sensitive areas and effectiveness of spill cleanup are completely dependent on favorable weather conditions (p. II-C-13, paragraph 7). Favorable weather conditions are the exception in the Bering Sea. (See, for example, p.II-C-13, Table II-2).

15-37 The DEIS assumes, without verification, that species with demersal eggs do not have narrowly restricted spawning habitat requirements. This assumption is important and should be noted, since the DEIS suggests (p. IV-B-10) that effects of drilling mud deposits on demersal eggs will be limited to immediate the vicinity of the discharge.

2.8.2 Toxicity

15-38 More background information is needed to support the information presented in Table IV-13. A critical factor in evaluating hazard of material is the relationship between exposure time and measures of toxicity. Tables IV-13 and IV-14, which present ranges of lethal concentrations for various fish groups and various life stages, give no reference to the exposure time (e.g., 1 hour, 48 hours, 96 hours). Another factor that is important in evaluating the toxicity of a substance is the conditions of the exposure (e.g., static, static replacement, flow through, temperature, etc.). Exposure conditions can significantly affect the results. Finally, it is not clear if the species that were tested to develop these ranges are all-inclusive of the species in the North Aleutian Basin. In other words, which organisms were tested to derive the ranges given and are these the same species that are found in the lease sale area? For example, toxicity information on Atlantic cod is not necessarily applicable to Pacific cod. Great differences in sensitivity can exist between organisms of the same genus.

The table (IV-13) is taken directly from Thorsteinson and Thorsteinson (with the exception of an error for flat fish eggs), but the appropriate exposure times, exposure conditions, and the specific species used to derive the numbers cannot be discerned without reading the text of the original source. This information should be summarized in the text and the limitations of using this information should be incorporated into the toxicity discussion in the EIS.

The original source states that few toxicologic studies have been conducted on the fin fish species found in the southeast Bering Sea (the article provides a list of fish species). The toxicity ranges give only a prediction of probable effects. Fish in the lease sale area could have different sensitivities. The original source of the toxicity data indicated that many of the bioassays were conducted under static conditions and the results are therefore more applkcable to spills in protected bays and lagoons and not to spills in open ocean conditions. Use of the information on this table could be misleading without the background information discussed above. This is especially important since the numbers presented on the table are being used for impact assessment.

2.8.3 Effects on Salmonids

15-39 Impacts of oil spills on salmonids are understated. High mortalities in nearshore areas are noted as having a MODERATE effect on the local population, (p. IV-B-18), and this is considered a MINOR effect on the regional population. Juvenile salmon tend to be very concentrated as they leave natal streams and migrate along the coast. Although an oil spill's effect may be localized, an oil spill could result in severe loss of stocks from particular river drainages that are concentrated in the nearshore zone at the time. Loss of a particular river stock should not be considered a MINOR impact even on a regional basis.

15-40 Fry and juvenile salmonids in the nearshore area feed on crustacean species that are either epibenthic or frequently rest on the bottom. These important food sources can be killed by oil spills. As noted on p. IV-A-4, oil spills impinging on mudflat areas such as Port Moller may result in long-term persistence of contaminated sediments. Therefore, the DEIS is incorrect to state that salmonids at Port Moller would be impacted only if the spill contacted the nearshore while vulnerable salmon lifestages were present.

2.8.4 Effects on Clupeiformes

15-41 It is incorrect to assume that oil spills contacting the nearshore zone would affect herring only if susceptible lifestages were present. As noted on p. IV-A-4, oil spills impinging on mudflat areas may result in long-term persistence of contaminated sediments. Thus, herring spawning activities could be adversely affected even during a winter spill event.

2.8.5 Effects on Groundfish

15-42 Groundfish species which are associated with the sediments would be exposed to oil contaminated sediments, tar balls, or emulsions. All groundfish occur at one phase of their life cycles or another in the nearshore environment where turbulent mixing and higher suspended sediment levels could enhance the sinking process of spilled oil. Many species use nearshore areas as juveniles (p. IV-B-25) and many of the juveniles of the various species can be found associated with the sediments.

Currently, only toxicity values for the water soluble fraction are discussed in relation to groundfish populations. The toxicity of oil in sediments and tar balls, and their impacts should be evaluated in the DEIS.

2.8.6 Effects on Crabs and Other Invertebrates

15-43 There is no discussion of exposure of invertebrates and other benthic organisms to contaminated sediments and tar balls. Juvenile crabs inhabit shallow bays and estuaries (often forming dense pods of thousands of individuals) for 1 to 5 years (p. IV-B-32). Not only could five year classes be affected by the initial spill mishap, but the nearshore, shallow water sediments could remain contaminated for many years in the future. The impact of this on the epifauna and infauna populations should be evaluated in the Revised DEIS. For example, would contaminated sediments prevent podding behavior or would the crab still congregate in areas with contaminated sediments and suffer many sublethal effects?

15-44 The finding of MINOR effects on fisheries is misleading. On p. IV-B-35, potentially MAJOR effects on red king crab are noted. The finding of MINOR effect is based on the procedure (discussed above) of averaging impacts from various activities over several species of harvestable organisms.

15-45 The DEIS notes that Alternative IV would reduce the risk to resources in Port Moller. It then goes on to note that Port Moller is the only important fisheries area having significant reduction in oil spill risk and that the "overall" effects on regional populations would remain the same. First, the risk assessment refers to Port Moller as Biological Resource Area 7. As depicted in Figure G-2, the target is only a small coast of the Alaska Peninsula. The risk analysis (Tables G-14 and G-20) shows that other land segments along the north shore of the Alaska Peninsula are also at less risk with Alternative IV. Thus, more resource areas than just Port Moller are offered less risk by Alternative IV. 15-46 Second, the use of an "overall" effect understates the impacts. The proposed alternative represents a MAJOR threat to red king crab. Our cover letter questions whether Alternative IV significantly reduces the risk to this species, and argues for a revised Alternative IV. Third, a pipeline is proposed to traverse Port Moller in either alternative. Thus, the conditional probability should not change for Port Moller as a launch point.

2.9 Marine and Coastal Birds

15-47 The DEIS discusses the potential dangers to birds from oil spills and direct disturbance from air and vessel traffic, but a worst-case situation is not analyzed. For example, if a transport-related spill of 1,000 barrels or more occurred during the summer in the vicinity of the Shumagin Islands, "major effects could occur" (p. IV-B- 43). These "major effects" are not defined. If, for example, several thousand seabirds were killed, would reproductive success for that year be drastically reduced? Long-lasting effects could impair the future use of the habitat. Other spills that have occurred could be referenced and used as a baseline for assessing the effects on birds.

2.10 Marine Mammals

15-48 Major, minor, and other impact definitions (Table S-2) are identical for endangered and non-endangered cetaceans. Because of the very nature of an endangered species, the meaning of these terms becomes questionable because any adverse impact on endangered species assumes significance. A change in local abundance recoverable in one breeding cycle may be a minor impact for a non-endangered species, but any adverse change may be of great importance to a small, endangered population.

15-49a Impacts are often evaluated on the basis of an "average" mammal distribution, but many of the marine mammals exhibit a clumped distribution. Thus, impacts are more likely to be either negligible or severe, depending on the time and location of interaction between the spill or activity and the species. For example, an average of 4-7 sea otters/sq km (p. IV-8-48) is unrealistic; groups of over 1,000 have been seen together in the area. Breeding concentrations of sea otters also exist. A similar "averaging" is made for right whales (p. IV-8-73) and probably others as well.

15-49b The DEIS appears to deal mainly with floating oil slicks when discussing impacts of oil spills on marine mammals, yet an oil spill results in three types of products: oil slicks on the water; dissolved (and toxic) hydrocarbons in the water column; and formation of tar balls, which sink and remain intact for long periods. The latter two categories are mentioned only briefly. Type and concentration of dissolved fractions are not discussed, nor is their impact evaluated. The persistence of tar balls and potential ingestion by bottom feeders such as gray whales and walrus is not discussed. Effect of tar balls on short- and long-term benthos mortality or productivity (mammal food sources) is also not addressed.

15-49c The 1982 information on gray whales determined that seismic sources confuse swimming and cause direction changes within 5 km of seismic testing but cause no physical harm or mortality. The 1984 biological opinion (p. IV-8-56), on the other hand, states seismic surveys would jeopardize continued existence if whale migration were altered. The DEIS should juxtapose the differences so that the reader can evaluate the information. If a 5 km distance is needed, the "high degree" of tolerance in para. 2, page IV-8-61, may be an oversimplification.

No evidence is given that ". . . only a few . . ." whales may be disturbed. This assertion seems unlikely since nearly all of the population migrates along the same route within a short period. Contrary to the statement in this paragraph, the previous discussion indicates seismic activity has altered migration and swimming patterns in other areas. The following paragraph also states noise may cause a change in migration routes, a factor the NMFS biological opinion concluded would jeopardize gray whale existence. Although the degree to which migration would be affected is unknown, this possibility exists.

15-50a The conclusion on page IV-8-84 in paragraph 2 that cetacean-oil interaction is unlikely is not supported. It also conflicts with the first sentence of paragraph 2 which states that the probability of interaction ranges from very unlikely to very likely. Similarly, in paragraph 3, interactions are said to be both "very unlikely" (less than 10 percent) and "a wide range of probabilities" (0.5-99.5 percent). Thus, a conclusion that interaction would not significantly adversely affect cetaceans is questionable. Furthermore, most non-endangered cetaceans do not eat plankton; thus, the rapid fecundity of zooplankton after a spill is of indirect importance in evaluating cetacean food sources. Fish, squid, and benthos would be primary food sources; and if harmed, these species would re-establish much more slowly than plankton.

15-50b Based on the variation of statements previously made within the section regarding likely or unlikely interactions, the conclusion that oil spills are unlikely to have significant adverse affects does not seem well substantiated.

15-51 The discussion of cumulative effects on page IV-8-75 (paragraph 2) seems full of conflicting statements. Cumulative effects are variously described as "difficult to determine," "may have major effect," "could be low," and "would be minor." Considering the range of possibilities, the certainty of the conclusion of MINOR impact seems dubious, particularly with the right whale population so low as to possibly be biologically extinct.

15-52 The statement that fin whales are seldom in the basin conflicts (p. IV-8-74) with statements in Chapter III (p. III-8-30) and Graphic 4 which indicate use of 80 percent of the lease sale. It also appears unlikely that the spill contact probability is similar to that of gray whales. Oil blown toward the Peninsula is likely to collect in gray whale summer feeding embayments such as Port Moller; both surface oil and tar balls could affect gray whales during summer feeding. As an oceanic species and a surface feeder, fin whales would not encounter this type of situation.

15-53a Disruption of normal feeding activity or fouling of baleen could do more harm than merely "diminishing blubber stores." Baleen whales feed only in summer. At the end of spring, blubber has already been depleted by three seasons of use. Prolonged impairment of feeding during summer would force whales to enter another winter and two migration periods without reserves necessary to sustain them, which could easily result in death of the animals.

2.11 Commercial Fishing Industry

15-53b The DEIS should discuss the impact of oil on groundfish stocks in relation to migration patterns. Most groundfish species migrate onshore during early spring for spawning, then migrate offshore during fall. Because a large portion of each groundfish stock migrate biannually through the North Aleutian Basin and the St. George Basin, the risk of exposure of a major portion of each stock to oil spills is great.

15-54a The DEIS should include information on several other topic areas relevant to the commercial fishing industry. It should discuss the impact of oil spills on potential fishery resources such as the Alaskan surf clam, snails, and shrimp. With the recent decline in crab stocks, fishermen may expand their harvests to include these species. There is no discussion on the impact of oil spills on recreational fishing for salmon. This fishery could be affected through reductions in adult escapement or through tainting of salmon flesh. The recreational industry is growing fast in the Bristol Bay area and it is second in economic importance only to the commercial fishery industry. The ADF&G estimates that the industry provides $25 to $40 million a year to the state's economy [Bristol Bay Cooperative Management Plan, Revised Draft EIS]. The DEIS should discuss the potential for tainting of fish flesh caused by direct exposure to oil in the water column or by consuming contaminated prey. The only discussion of flesh tainting is during actual harvest of crab and fish.

15-54b On page IV-B-93 the DEIS describes the probability of an oil spill reaching a particular location of the crab fishing grounds. Because crab boats use seawater to maintain live crabs, any oil residue may kill or taint the flesh of crabs. Therefore, the DEIS should estimate the duration that oil residue may stay in the water and harm captured crabs.

15-55 The DEIS provides (p. IV-B-88) an example of catch loss due to fishing restrictions near platforms or pipelines. An annual loss of 400,000 lbs of red king crab, 265,000 lbs of tanner crab (C. bairdi), 162,000 lbs of tanner crab (C. opilio), and 608 metric tons of groundfish is estimated as a worst-case scenario. The dollar value of crab harvest losses alone could be over $1.5 million per year. Losses such as this can be substantial in a competitive fishery. Thus, the potential loss due to fishing restrictions should not be classified as MINOR but as MAJOR.

15-56 We disagree with the conclusion on page IV-B-95 that losses to the fishing industry due to fish and crab mortalities would be MINOR (see "Fisheries Resources" section). Port Moller salmon and herring fisheries could be severely affected by an offshore oil spill. Additionally, the tremendous salmon resources of Bristol Bay could be severely affected by spring, summer, or fall oil spills. Many juvenile salmon probably migrate slower after reaching the Port Moller area, perhaps to feed on the abundant zooplankton and other prey. Therefore, these fish could be exposed to oil for significant periods of time. Prey items may also be killed or may contaminate feeding salmon. If displacement of salmon were to occur, then a significant food source of salmon could be missed. Delays of adult salmon migrating back to natal streams could have a significant impact on future year classes because of the critical relationship between spawning period and emergence timing. Salmon fry that emerge late or early would have lower chance of survival. Sand lance, which is a major forage fish for salmon and other fishes, bury into sand and could be exposed to potentially lethal, as well as sublethal, oil concentrations that remain in sediments for long periods of time.

15-57 The salmon and herring fisheries should not be considered short in duration and therefore having less probability of being affected by oil spills. Herring fisheries begin in the early spring and are closely followed by salmon fisheries. Fishing for salmon in Port Moller may continue to the end of August.

15-58 We also disagree with the conclusions (p. IV-B-97) regarding cumulative effects on the commercial fishing industry. As discussed previously, potential oil spills and fishing area restrictions represent a serious potential loss to fishermen. Such losses are particularly important on a local basis where fishermen are restricted by vessel size or permit conditions. Several oil spills would greatly increase the magnitude of the impact because of the immediate effect of each spill and the accumulation of oil in sediments. Furthermore, oil production in the adjacent St. George Basin increases the probability that cumulative impacts from oil spills and fishing area restrictions will occur.

The description of the environmental setting provides the necessary background information that forms the basis for the comparative evaluation of each alternative. Our review of the DEIS has identified several areas where more information is required in order to fully understand the nature and magnitude of the impacts of the alternatives considered.

3.1 Physical Oceanography and Meteorology

15-59 The discussion on meteorology lacks crucial information on a number of features which have bearing on the oil spill risk evaluations. The discussion of the meteorological conditions for the North Aleutian Basin lease sale area should be sufficient in detail to interpret the oil spill risk model, to indicate the risks of transporting oil, and to describe possible meteorological effects on day-to-day exploration and production activities. The discussion of meteorological conditions is a two paragraph summary of a paper presented by Overland [1981]. Lacking are:

1. A discussion of storm intensity, storm frequency, and typical storm tracks.

2. A discussion of fog and icing conditions which could inhibit cleanup activities and affect shipping through Unimak Pass and in and out of Balboa Bay.

Detailed and more recent studies than those referenced in the DEIS have been done by the NOAA-PMEL Laboratory. These studies could be incorporated into the DEIS analysis with relatively little effort. They are identified in the reference section of this report.

15-60 The discussion of physical oceanography is too abbreviated to describe the environment in which oil production will occur. Subjects that are missing or lacking sufficient detail are:

1. The oceanography of Balboa Bay, where a port facility is planned, and its approaches.

2. The ocean environment on the south side of the Alaska Peninsula.

3. A discussion of sea ice in the lease sale area. Ice cover is assumed for all wintertime estimates of oil spill trajectories.

4. A discussion of tides and wind-generated waves.

The discussion of the physical oceanography is extremely brief and is primarily based on papers by Kinder and Schumacher [1981a, 1981b]. The discussion should assist in interpreting oil spill risks associated with exploration and production of oil from the North Aleutian Basin. Existing publications contain sufficient information to add substantially to the discussion.

15-61a The frequency of ice cover and its characteristics (i.e., broken and drifting or solid) are not discussed. According to Graphic 2 in the DEIS, ice cover should be rare over the lease area. However, solid ice cover is apparently assumed in the oil spill risk analysis for all winter months. The discussion on oceanography should address this contradiction.

15-61b The two sources of energy which will disperse discharged drilling muds and cuttings are tides and wind-induced waves. The discussion does not include wind-induced waves, and tides are only briefly mentioned.

3.2 Fishery Resources

In general, the DEIS provided an adequate life-history description of most economically and ecologically important fishes in the lease sale area.

15-62 The DEIS should provide an overview of how fishes interact with other organisms and how they respond to seasonal changes in the environment. A discussion of trophic structure and species dynamics in relation to habitat zones is necessary. The DEIS needs to discuss the importance of interaction between major species (e.g., whether they are predators, prey, or competitors of fish species) in order to assess indirect effects of oil spills and the direct effects of development and production phase discharges on these species. The guiding theme in such a discussion should be to describe how the eastern Bering Sea ecosystem functions. We suggest that the EIS incorporate a food web diagram such as that provided in our preliminary ODCE for the area [Jones & Stokes 1984].

15-63 The DEIS should identify uncertainties when they exist. Much of what we know about fishes in the Bering Sea, especially salmonids and forage species, is based on a small number of samples during only a few seasons or less of investigation. For example, little information is available to describe the spawning migration of chinook and coho salmon, little is known about the time interval between hatching of herring eggs and movement of juveniles offshore, and the southerly migration of herring along the Alaska Peninsula has not been documented. Spawning grounds of capelin and other forage fish are not well documented along the Alaska Peninsula.

15-64a Although the DEIS mentions that Bristol Bay is the largest producer of sockeye salmon in the world, a range of total run size (catch and spawning density) should be given. Although sufficient spawning escapements in 1974 and 1975 contributed to the large runs in 1980 and 1981, the current hypothesis is that mild winter conditions and overall warmer ocean temperatures led to larger than average sockeye runs in recent years. Sockeye production in the Chignik River system should not be labeled as small. In 1984, a record 3 million sockeye returned to the system at a value of over $20 million to the fishermen. Also, Chignik and Bristol Bay sockeye are probably the major stocks captured by Shumagin Island and Stepovak area fishermen, although tagging information is limited in these areas.

15-64b Chinook represent approximately 2.2 percent of the commercial salmon catch for the Bering Sea. A range of run sizes should be given for Bristol Bay and the Alaska Peninsula for Chinook as well as pink, chum and coho salmon.

15-64c The FEIS should include information from two NOAA-funded studies conducted in nearshore waters of the Alaska Peninsula, especially when describing fish utilization and dynamics in Port Moller. These studies should provide information on nearshore utilization by forage and juvenile fishes. (Please see the reference section of this report for the titles and RFP numbers for these studies).

15-65 Since the proposed plan is to run an oil pipeline through Port Moller and Herendeen Bay and across the Alaska Peninsula to Balboa Bay, a section of the chapter describing the affected environment should be devoted to describing anadromous fish populations and community functions in these and nearshore marine habitats. Additionally, the DEIS does not mention whether fishes exist in streams along the proposed transportation corridor between Herendeen Bay and Balboa Bay.

3.3 Invertebrates

15-66a Although diets of commercially important invertebrate species are noted, the importance of these and other invertebrate organisms in the food chain of the southeastern Bering Sea is not adequately highlighted. There should be a brief discussion of which invertebrate species are particularly critical to higher trophic levels or ecosystem function. This is necessary in order to evaluate the significance of oil spills, other water quality problems, or habitat loss on the marine environment.

In order to evaluate the significance of oil spills or other major environmental perturbations on key invertebrate species, information must be available on whether the organisms are concentrated in or use a particular area or habitat during their life history. This discussion is adequate in some cases and inadequate in others. In all cases, the information is needed to evaluate the risk, magnitude, and significance of potential adverse effects.

15-66b Insufficient information is given on the habitat types and invertebrate resources of Port Moller and Balboa Bay to determine the effect of pipeline construction and shore facilities on these resources. The estuarine environment of Port Moller is particularly critical to overwintering birds, who probably depend on invertebrates and small fish for food.

15-67 Several concerns are noted in the discussion of pelagic invertebrates (p. III-B-15): 1) No discussion is given of the role of pelagic invertebrates in the ecosystem. 2) No information is given as to key species and their susceptibilities to oil spills (e.g., whether they are concentrated in the upper water column layers). 3) The discussion focuses almost entirely on crustaceans. Cnidarians and ctenophores are certainly present, but is it assumed that they have either no key role in ecosystem function or no risk of adverse effects? 4) Amphipods and euphausiids are the most important food items for whom?

3.4 Marine Mammals

15-68 A critical or important habitat section similar to that presented for birds should be added to the mammal section. It should include areas such as Izembek Lagoon and Port Moller as gray whale summer-use areas and major harbor-seal haulout areas, as well as indicating the gray whale spring-migration route. The importance of the Bering Sea as a summer feeding area for many species, and the fact that many baleen whales obtain nearly all of their yearly food supply during summer, should be more clearly brought out in this section.

3.5 Commercial Fisheries

15-69a Although the DEIS adequately describes subsistence harvests in the southeastern Bering Sea, it does not mention sportfishing activities that occur for salmon in freshwater streams. Sportfishing in Bristol Bay depends on salmon that migrate through the lease sale area and provides numerous jobs for local residents. Sportfishing harvests should be described.

15-69b The potential of commercial harvests for shrimp, snails, blue and brown king crab, Korean hair crab, and Alaskan surf clam in the lease sale area is not mentioned. Fisheries for these species presently occur or have occurred in the past in adjacent areas. Resource assessment cruise data collected by National Marine Fisheries Service should be used to assess the potential resource.

15-70 The DEIS provides a good description of commercial crab and groundfish harvests in the Bering Sea, but it does not mention those commercial harvests that occur near Balboa Bay on the south side of the Alaska Peninsula. These fisheries should be described because oil spills could occur during tanker loading and transportation operations at Balboa Bay.

3.6 Terrestrial Resources

15-71 No information is given on terrestrial resources other than brown bear and caribou along the proposed pipeline corridor from Herendeen Bay to Balboa Bay. An adequate screening-level analysis of the potential impacts on anadromous and freshwater fish in nearby streams and other wildlife resources of the Alaska Peninsula National Wildlife Refuge is not provided. Although the DEIS notes that the corridor was selected by other planning documents (p. II-C-1), it does not indicate the nature of the information or process used in making the selection. For example, it is not mentioned whether alternative corridors were evaluated and why this corridor was selected.

3.7 Water Quality

15-72 It is not clear whether the broad generalizations in the DEIS regarding regional water quality are appropriate for Port Moller, Herendeen Bay, Balboa Bay, the Portage Valley River, and Foster Creek. Since these water bodies are locations of, or parallel the trans-peninsula pipeline facilities, construction and operation of the pipeline and tanker terminal could significantly impact water quality. The information in this chapter, however, is inadequate to conduct a screening-level analysis of the environmental impact of this aspect of the proposal on water quality.

Additionally, data exist that more precisely describe the water quality conditions in the lease sale area. The data presented in the DEIS are generic for Bristol Bay and may or may not match conditions in the project area. With minimum effort, the existing literature could be used to develop a more appropriate description of water quality in the project area.

CHAPTER 4 OTHER ISSUES

4.1 Alternatives Considered

Although four alternatives are presented and evaluated in the DEIS, clarification of the differences between them is lacking. Review of the DEIS reveals that functionally there are really only two alternatives. According to Chapter II,
15-73 Alternatives I (the proposed action) and IV (the Alaskan Peninsula deferral) result in identical projected oil and gas resources (Table II-1) but significant differences in environmental impact. Alternative IV is distinguished from Alternative I only in that the former deletes 137 lease blocks along the Alaska Peninsula. The DEIS should clarify the difference between these two alternatives.

Chapter I (pp. I-D-6 and 7) states that USFWS requested a deferral of blocks less
15-74 than 70 m in depth and that these blocks were deleted from the sale. This conflicts with the description of Alternative I (the proposed action) in Chapter II, in which depths are said to range from 30-100 m (p. II-B-1).

There are inconsistencies with the oil and gas resource estimates. The values given in Chapter IV, Table IV-8, are in conflict with the numbers shown in Table II-1. The values in Table II-1 and Table IV-8 are inconsistent with the estimates presented
15-75 in the Federal Offshore Statistics, September 1984 (p. 100). The difference in oil production (shown on Table IV-8) for Alternative IV purportedly results in lower risk of one or more spills of more than 1,000 bbl but no change in risk of one or more spills of more than 100,000 bbl. These are inconsistencies that should be corrected.

There is also confusion and a lack of definition about the differences between Alternative II (no sale) and Alternative III (delay the sale). The text states that Alternative II (no sale) represents a cancellation of the lease sale in the current 5-year lease schedule, but then it states the opportunity to "eventually produce" oil and gas would be "foregone," as if the cancellation were in perpetuity. This latter
15-76 impression is also given in Chapter I. If, however, the sale were to be reconsidered during the next 5-year lease schedule, then Alternative II (no sale) is effectively no different than Alternative III which postpones the lease sale for 5 years. If the sale is to be permanently cancelled under Alternative II, the description should be reworded to specifically state this finality. Again, more clarification is needed to define the differences between these two alternatives.

Finally, and perhaps most important, it should be stressed in the introduction to Chapter II that the proposed alternative described by the DEIS is not a worst-case
15-77 scenario. The proposed action is a mean-case development scenario for primary recovery operations only. A maximum-case development scenario would involve an increased number of oil and gas platforms, greater impacts on wildlife, and a substantial increase in spill risk probabilities.

4.2 Mitigation Measures

The DEIS does not clearly differentiate between potential mitigation measures
15-78 which are enforceable (NTLs) and those which are advisory but not enforceable (ITLs), particularly in the discussion of specific ITLs. As a result, the Potential Mitigating Measures section (p. II-C-2) can be confusing to the general public.

Confusion is further compounded by several factors. First, there are format inconsistencies among the potential stipulations (NTLs). Second, the "purpose" statements should be brief and introduce the material in both stipulations and information sections, thereby helping the reader evaluate the effectiveness of the proposed mitigation measure. Third, much of the "purpose" material would be better placed in the accompanying descriptive portion (see "purpose" on p. II-C-9, for example). Fourth, ITLs on bird and mammal protection and on endangered species (pp. II-C-8 through 10) are particularly redundant and confusing. For example, there are two ITLs on endangered whales (p. II-C-10) that could be easily combined.

We question whether "increased awareness" of environmental issues on the part of operators constitutes a mitigation measure. Mitigation measures generally carry
15-79 the connotation of "alleviation" or "replacement." Thus, a mitigation measure should alleviate the impact of an oil spill, for example, rather than reduce the risk. Alternatively, a mitigation measure should actively benefit a resource that otherwise remains unaffected as partial compensation for adverse effects on another resource.

Greater care must be taken in the interchanging of words such as "would" and "could" because they are not equivalent. For example, because regulations could help prevent disturbance, it does not necessarily follow that overall impact would be
15-80 minor (p. IV-B-51) or is likely to be minor (p. IV-B-52). This follows only if methods are established to ensure implementation of the controls. Assumptions of mitigating actions should be carefully stated with the impact judgments to prevent these contingent requirements from being overlooked (or the need for it omitted from impact summaries).

Stipulation No. 3 Protection of Biological Resources (p. II-C-4) sounds all right in context but it does not appear to provide actual protection of biological resources. If an important biological resource requiring special protection has not been
15-81 identified at this time, how will the RSFO become aware of it before damage is incurred? How often and in what situations has this stipulation actually been invoked for prior lease sales? How effective has this stipulation been in avoiding damage to important biological resources?

The assumption in Stipulation No. 5 Transportation of Hydrocarbons (p. II-C-5) that pipelines are environmentally preferable to tanker transport is unverified. We
15-82 are not aware of data on spill rates for offshore loading of tankers at platforms. MMS assumes (p. IV-A-8) with no support reference that this activity is included in spill statistics for tankers at sea.

Consideration should be given to a stipulation that restricts seismic testing to winter, i.e., times not coinciding with endangered mammal migration or use of the area. The DEIS (p. IV-A-3) notes that weather considerations generally result in
15-83 seismic testing during summer. Although it may result in higher costs to the lessee, the environmentally preferred action would be winter surveys. It would be inconsistent to argue that winter weather conditions preclude seismic operations but not drilling, production, or transport activities.

CHAPTER 5 TECHNICAL CORRECTIONS & QUESTIONS

5.1 Alternatives Comparison

p. II-C-1 Alternative I - Proposal

The total number of offshore platforms is unclear in this chapter. It should be clarified whether two separate platforms will be constructed, as is noted in Chapter IV (p. IV-A-1).

p. II-C-11 Information on the Aleutian Canada Goose

Avatanak Island and Unimak Island should be mentioned as possible nesting and staging areas for the Aleutian Canada Goose (as noted in Graphic 6).

p. II-C-13 Marine and Coastal Birds

A 1,500 foot flight height is recommended. Most of the air traffic is likely to be helicopters. How will this recommended flight height be enforced?

p. II-C-16 Alternative IV - Alaska Peninsula Deferral

Depths of the lease area under Alternative IV should be given here. The only other reference is found much later on p. IV-E-1.

p. IV-A-1 Development Timetable

The development timetable is inconsistent between text and Tables IV-1 and IV-2. The end date of exploration and development activities is not consistent nor is the number of exploration wells.

5.2 Affected Environment

5.2.1 Fish

p. III-B-3 Chinook Salmon

The fourth sentence in the last paragraph is confusing. Is it meant that juvenile chinook from Nushagak River migrate rapidly through Bristol Bay before aggregating and migrating along the Alaska Peninsula?

p. III-B-7 Rainbow Smelt

The DEIS should describe the location of major spawning streams of rainbow smelt, if known.

p. III-B-7 Walleye Pollock

The DEIS should describe the important role of pollock in the Bering Sea ecosystem.

p. III-B-9 Pacific Ocean Perch

What is the estimated abundance of Pacific Ocean perch? Are the stocks stable?

p. III-B-9 Atka Mackerel

What is the estimated abundance of Atka mackerel (relative or absolute) and is the population stable?

p. III-B-10 Sablefish

What is the estimated abundance of sablefish and is the population stable?

p. III-B-11 Pacific Sand Lance

Adult sand lance bury themselves in sand during the night also. Results of the 1984 NOAA-funded study are pertinent to the discussion of sand lance. (See the reference section of this report).

p. III-B-11 Yellowfin Sole

What is the rank of yellowfin sole among demersal fishes? Again, results of the 1984 NOAA-funded study are pertinent to the discussion of yellowfin sole.

p. III-B-13 Pacific Halibut

Is the Pacific halibut population presently stable?

5.2.2 Invertebrates

p. III-B-16 Epifauna/Red King Crab

The introductory paragraph under "Epifauna" notes that echinoderms account for more than 80 percent of the epibenthic biomass. The paragraph then notes that commercially important crab species are dominant epifauna. The first paragraph of "Red King Crab" notes that king crab are the dominant component of the epifaunal community. The authors apparently intended to refer to a certain feature when using the term "dominant," but the intended feature cannot be inferred from the context.

p. III-B-17 Tanner Crabs

The genus name is consistently misspelled throughout the DEIS.

p. III-B-18 Korean Hair Crab

There is no mention of the habitat of the larval stage, i.e., whether they are epipelagic and therefore at risk from oil slicks.

5.2.3 Marine & Coastal Birds

p. III-B-19 Habitats

In the second paragraph, it would be helpful to give percentage values for portions of the lease area within each shelf zone instead of stating that "Most of the lease area lies . . ." and "Virtually all the remainder . . ."

Table III-4

Footnote "e" is not consistent with the numerical data presented in the table. If murres and tufted puffins are included in the alcids, the totals should reflect this.

Table III-11

First word of title should be "Waterfowl," not "Waterfall."

p. III-B-22 Alaska Peninsula

The last sentence of the second paragraph should have a reference to support the statement.

p. III-B-32 American Peregrine Falcon

The reference (USDOI, FWS, 1982) cited in the text is not included in the Bibliography.

Bibliography p. 17

The references (Hunt et al. 1981a,b,c,d) are cited in the text in the Marine and Coastal Birds section (Pages III-B-19 through III-B-23). The letters are omitted from the bibliography citations; therefore, the reader does not know which one of the four documents is being referenced.

p. III-B-19 through III-B-23

The following references cited in the section on Marine and Coastal Birds were omitted from the Bibliography: ADFG 1977; Conant and Hodges 1984; Garett and Wege 1984; Gill and Handel 1981; Hunt et al. 1980, 1981d; King and Conant 1983; Kinder et al. 1982; Petersen and Sigman 1977; USDOI, FWS unpubl. data; USDOI, Navarin Basin FEIS 1983. In addition, no personal communication references were included as part of the bibliography. When personal communications are used in the text, the bibliography often is divided into Literature Cited and Personal Communications sections. On page III-B-23, Petersen pers. comm. 1984 is used as a reference; this person's affiliation and the date of contact should be part of the bibliography. "Personnel" should be changed to "personal" in text.

5.2.4 Pinnipeds

p. III-B-25 Steller Sea Lion

It should be mentioned that a rookery exists on Amak Island adjacent to the lease sale. Sea lions may forage in deeper water than is reported in the DEIS. Gentry and Withrow (1978) indicate sea lions generally forage in less than 180 m of water.

p. III-B-25 Harbor Seals

The number of harbor seals in Izembek Lagoon may be substantially greater than given here. Lewbel (1983) estimates the Izembek/Moffet Lagoon population at 4,500.

p. III-B-27 Walrus

Because walrus are specialized feeders and are already stressed by limited food supplies, they will be less able to tolerate any additional stress on food supplies that may result from project activities. This sensitivity should be clearly brought out. It is likely walrus feed primarily at more shallow depths. Kenyon (1978) indicates the majority of feeding occurs between 36-60 m.

5.2.5 Endangered Species

p. III-B-28 Bowhead Whale

A reference should be provided for the population estimate. Other sources (International Whaling Commission; Braham et al. 1982) show much lower figures.

p. III-B-29 Sperm Whale

Although population estimates usually vary, other authors place the population of the North Pacific much lower, around 150,000.

p. III-B-31 Gray Whale

It should be noted that feeding of gray whales is generally restricted to areas having depths of less than 50-60 m.

Figure III-15

Figure III-15 is very "busy" and confusing; it should be redone. The lease sale boundaries shown on the figure are for the St. George Basin; these should be changed to show Lease Sale 92.

p. III-B-34 Beluga Whale

Fiscus et al. (1976) note that the beluga's sensitivity to human activity during calving makes this species particularly vulnerable to continental shelf development.

5.2.6 Commercial Fishing Industry

The DEIS should mention that exploratory test fisheries for bottomfish have been conducted in the inner Bristol Bay area. If these results indicate large numbers of fish, then additional fisheries could develop in the near future.

The DEIS should clarify the statement regarding herring fisheries in the North Aleutian Basin; the Stepovak Bay fishery (near the Shumagin Islands) is not located in the basin.

p. III-C-3 Salmon Fishery

The last sentence of the first paragraph should mention that the lease sale could affect the North and South Peninsula fisheries because oil may be transported from Balboa Bay.

p. III-C-3 Salmon Fishery

Although the Bristol Bay sockeye salmon run tends to be cyclic, run sizes do not tend to be greater in odd-numbered years.

p. III-C-4

When describing species composition of the salmon harvests, weight as well as number of salmon should be included because of large differences in weight between the species. Fishermen are being paid for pounds of fish, not number of fish.

p. III-C-4 Alaska Peninsula

Locations of the major salmon fisheries along the north and south Alaska Peninsula should be mentioned.

p. III-C-4 Ex-Vessel Value

The maximum value of the Alaska Peninsula salmon fisheries reported in the DEIS may have been exceeded in 1984. For example, the Chignik Lakes fishery, located on the south side of the Alaska Peninsula, had a record year and was valued at over $20 million. p. III-C-5 Table III-12

Units should be given in the table, i.e., $0.56/lb of canned fish.

p. III-C-16 King Crab

The DEIS should mention the area of the Bering Sea Management Area where blue and brown king crab are harvested.

p. III-C-16 King Crab

Although blue and brown king crab are not harvested in the North Aleutian Basin Planning Area, the DEIS should mention what the potential harvests might be.

p. III-C-18 Crab Ex-Vessel and Wholesale Values

The term "fish" used in the last sentence should be changed to crab.

p. III-C-18 Catch

Rockfish, sablefish, mackerel, etc. are not considered flatfish as suggested in the DEIS. Also, sardines and anchovies are not harvested in the Bering Sea.

5.2.7 Air & Water Quality

p. III-D-1

Should it be assumed that methane production at the sediment-water interface of the St. George Basin can be extrapolated to the North Aleutian Basin?

p. III-D-2 Air Quality

The DEIS should note that a Class I area (Simeonof Wilderness) is about 100 km from Balboa Bay in the Shumagin Islands.

Table III-44 State of Alaska Ambient Air Quality Standards

Footnote "d" should be deleted since the Federal standard is also specific for ozone (not photochemical oxidant measured as ozone).

5.3 Environmental Consequences

5.3.1 Oil Spill Effects

p. IV-A-1

In addition to inconsistencies relative to number of exploratory wells, Table IV-1 is characterized by other inconsistencies and omissions. Values for quantity of drilling muds during exploration are not consistent with the text on p. IV-A-5. No data are given for quantity of drilling mud discharges during production. Reference should be made in the table to sanitary waste discharges during exploration. Other miscellaneous discharges (e.g., boiler blowdown, test fluids, deck drainage) are not mentioned. Even if values are not readily available, some reference should be made in this table to these discharges, especially since biocides may be included in some of these discharges. Biocides in discharges are potentially significant sources of adverse environmental impact. A footnote should be used to indicate that produced water volumes are based on primary recovery operations only; higher values would result from secondary recovery operations.

p. IV-A-10 Trajectory Analysis

The trajectory analysis appears to be based on an instantaneous spill (at a single point in time). What happens in the case of a well blowout where oil is released into the environment for several weeks before well control is regained? How does this scenario affect the size of the area which could be affected?

5.3.2 Fisheries--General Effects

p. IV-B-5 Table IV-13

The reference source is not easily found in the literature citation section. Only someone who is familiar with the information would know where to find the original data.

p. IV-B-4 Oil Spill Effects

In the middle of the middle paragraph, hatching success of herring eggs is mentioned. The next sentence refers to larval stages as the "most sensitive of these early invertebrate lifestages." Since herring are not invertebrates, the use of "these" is either an error or it indicates missing text material.

p. IV-B-5 Discharge Effects

When citing references for other studies done in other environments, possible differences from the North Aleutian Basin should be noted. In particular, great care should be used in applying the results of studies in Cook Inlet to the North Aleutian Basin. Unlike the North Aleutian Basin, Cook Inlet is a very high energy, highly turbid environment.

p. IV-B-6 Dispersant Effects

One important issue on the use of dispersants has not been discussed: how would dispersants be applied in the Bering Sea and what effect does weather have on the feasibility of application?

p. IV-B-7 Dispersant Effects

In the middle of the page it is noted that dispersant resulted in 50 and 90 percent of the total volume of two types of oil being dispersed in a 1978 East Coast study. The meaning of this is unclear.

p. IV-B-10 to p. IV-B-12 Benthic Habitat

What levels of toxicants might exist in the interstitial water of the bottom sediments? How do these concentrations compare with the lethal and sublethal concentrations for benthic infauna? Are there any areas or seasons when localized losses of benthic productivity would be more significant?

p. IV-B-11 Benthic Habitat

The reference to USDOI 1978 (middle of the page) is important but not listed in the reference section.

p. IV-B-14 Effects on Salmonids

In the first full paragraph, reference is made to "ground-level discharges." The meaning of this is unclear, and the implications are also not clear.

pp. IV-B-16 and 17 Cinder River to Cape Newenham - Unimak Pass

To be consistent, the DEIS should report conditional probability of an oil spill contacting the specified resource areas in 3, 10, and 30 days in all cases.

p. IV-B-21 Effects on Clupeiformes

Toward the end of the first full paragraph, reference is made to "these two year-classes." Eggs and larvae are probably the same year-class since hatching occurs in days and larvae move offshore before winter. Thus, either "year-classes" is an error or text material is missing.

p. IV-B-23 Port Moller

The paragraph in the middle of the page implies that a loss of the Port Moller spawning stock would affect only a portion of the regional herring population. It is noted that larger spawning stocks occur near Togiak and at Port Heiden. On page IV-B-25, Port Moller is noted as one of the three top spawning areas. For proper balance, this fact should also be noted on p. IV-B-23.

p. IV-B-28 Cumulative Effects (Effects on Groundfish)

Reference to clupeiformes in discussion of cumulative effects on groundfish is in error.

p. IV-B-29 Effects on Crabs and Other Invertebrates

The section is more properly called "Effects on Crabs and Other Harvested Invertebrates" since no discussion is given to non-harvested invertebrates.

5.3.3 Pinnipeds

p. IV-B-47 Indirect Oil Spill Effects

Walrus populations are already food-limited. They would probably be at least as affected as the otter.

p. IV-B-47 Indirect Oil Spill Effects

Pollutants may also occur in lethal as well as sublethal concentrations.

p. IV-B-47 Indirect Oil Spill Effects

It should not be assumed that oil slicks will cover small localized areas. Slick size depends on spill volume, current, and many other factors. Even a spill of 2,000 bbl is said to have covered 100 sq km (following page).

p. IV-B-48 Site-Specific Effects

Sea otter groups up to 1,000 animals have been seen in the area. The average number/sq km does not represent an actual distribution.

p. IV-B-49 Site-Specific Effects

"Several years" of sea otter recovery is misleading. After a decade, the population has still not recovered from the 1971-74 reduction (p. IV-B-50).

p. IV-B-51 Site-Specific Noise Disturbance

The level, frequency, and number of seismic disturbances should be described. The fact that noise may carry several hundred kilometers (p. IV-B-59) should also be noted.

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p. IV-B-52 Summary

How can a population be exposed to a spill without coming into contact with it?

p. IV-B-52 Summary

Transitory noise is sufficient to affect pupping activity (p. IV-B-50); disturbance effects should not be assumed "likely to be minor" unless assurance noise-prevention can be established.

p. IV-B-54 Cumulative Effects

Since walrus populations may already be stressed, impacts may be more critical than the statement would indicate.

5.3.4 Endangered Species

p. IV-B-58 General Discussion

The gray whale feeds by engulfing several cubic yards of sediment at once. There is, therefore, potential for not only ingestion of contaminated food but also tar balls.

p. IV-B-61 Gray Whales

The text refers to the St. George Basin rather than the North Aleutian Basin. This is obviously an error.

p. IV-B-62 Gray Whales

The last sentence of paragraph 3 appears to conflict with most of the same paragraph. A variety of sounds, not just "...only the loudest..." appeared to impact migration.

p. IV-B-68 Bowhead and Right Whales

The distance considered to be "near the site" should be defined. The following pages indicate disturbance can occur at 5 km and more.

p. IV-B-68 Bowhead and Right Whales

Extrapolation of effects to right whale may be probable, but too little is known to be definite in this regard.

p. IV-B-71 Bowhead and Right Whales

With the right whale nearly extinct, how can any effect be judged "most likely to be minor"?

p. IV-B-80 Direct and Indirect Effects

There appears to be no basis for the statement that "It is not reasonable to expect that cetaceans would stay in a harmful environment . . ." This conflicts with many previous statements about whales feeding in oil slicks, and other statements about marine mammals not avoiding oil.

p. IV-B-85 Noise and Seismic Activities

Disturbances are said to be ". . . unlikely to significantly affect cetaceans." This is followed, however, by statements on noise affecting belugas and gray whales. The degree to which disturbance is "significant" should be defined.

5.3.5 Commercial Fisheries

p. IV-B-88 Effects on Commercial Fishing Industry

Although the intentions of the Oil/Fisheries Group of Alaska are good, communication of potential problems to fishermen can be especially difficult during the fishing season. This mitigation measure remains unproven.

p. IV-B-90 Trawl Gear Damage

The DEIS should mention the encounter rate of fishing vessels receiving gear damage in the North Sea rather than stating that it is negligible. What is the density of fishing vessels relative to density of obstructions on the seafloor of the North Sea, and how does this compare to fishing activity in the North Aleutian Basin lease sale area?

p. IV-B-91 Effects on Fishing Operations

What is the conclusion of the DEIS regarding the effect of an oil spill on fishing operations given that a spill of 1,000 bbl will occur? Since the spill could occur near a major fishery, it seems reasonable that the potential effect could be great.

p. IV-B-94 Fisheries of the Southern Coast of the Alaska Peninsula

The descriptions of the fishery harvests south of the Alaska Peninsula should be placed in Chapter III.

5.3.6 Other Alternatives

p. IV-C-1 Alternative II

Table IV-13 referenced in text is actually Table IV-17.

p. IV-E-4 Endangered Species

Izembek Lagoon should be mentioned as a gray whale summer use area.

5.3.7 Other Issues

5.3.7.1 Water Quality

p. IV-F-2 Deliberate Discharges

Drilling fluids contain a number of additives, including biocides and metal-containing compounds. The impact of mud additives on water quality should be described. Resuspension of drilling muds may also result in short-term turbidity subsequent to initial deposition.

p. IV-F-3 Oil Spills

Types and concentrations of dissolved hydrocarbons originating from oil spills and their effects on water quality should be described.

p. IV-F-4 Alternative IV

If one spill of 1,000 bbl or greater is expected for Alternative I (p. IV-F-2), why should the number be reduced for Alternative IV when the estimated oil and gas resources remains unchanged (Chapter II)?

5.3.7.2 Air Quality

Table IV-18

Table IV-18 (and related text discussions) should be revised to reflect the distance offshore of the closest block rather than the 5 km distance shown. The description of Lease Sale 92 (p. II-B-1) indicates that the closest blocks are 18 km offshore. At this distance, the air quality analysis exemption level for CO would be 15,426.1 metric tons/yr, while the exemption level for other pollutants would be 337.9 metric tons/yr.

p. IV-F-4 Normal Offshore Operations

The Department of Interior's air quality analysis exemption procedure should be explained and related to those federal and state air quality permit requirements and procedures that apply to the project. The June 1983 EIS for the proposed February 1984 Southern California OCS Lease Offering contains an appendix discussion of the OCS exemption regulations which may be helpful.

Collecting additional meteorological data and monitored pollutant data in the North Aleutian area should be considered for future EIS's.

An annually updated emission inventory of OCS sources should be kept to aid in cumulative modeling and more efficient and equitable development of mitigation measures for State-controlled and MMS-controlled sources.

It is not clear whether emissions presented in Tables IV-20 & 21 are controlled or uncontrolled. If Table IV-21 represents controlled emissions, TSP would also qualify for PSD review in the discussion at the middle of p.IV-F-5, because it exceeds the PSD significance level of 25 tons per year.

We suggest using English units (metric units may be included in parentheses) in text and in all air quality tables, as the Clean Air Act, EPA and DOI regulations use English units.

p. IV-F-4 Normal Offshore Operations

The last sentence on this page should be revised to be consistent with the information presented in Table IV-18.

The statement that "It is unlikely that the exemption limitations for [NO_x] would be exceeded because drilling sites would be scattered and located more than 5 km offshore" is misleading. Footnote 3 to Table IV- 18 indicates that the emission

estimates are for a single platform with 13 wells. The emission estimates in Table IV-18 indicate that OCS exemption levels for NOx would be exceeded with platforms up to 58.6 and 69.6 km offshore during average and peak production, respectively. During average and peak production, OCS exemption levels for VOC would be exceeded for platforms up to 190 and 230 km offshore, respectively.

Is there any potential for significant hydrogen sulfide emissions from exploratory drilling, offshore production operations, or onshore facilities?

Page IV-F-6 states that burning a gas blowout would "... very slightly increase emissions -- relative to quantities in other oil and gas industry emissions -- or (sic?) other pollutants (Table IV-22)." This statement can be misleading, and should perhaps be replaced by simply referring to Table IV-22. Emission units should be added to Table IV-22; and a per unit time should be added to Table IV-23.

The EIS should also discuss the impacts on the aquatic ecosystem of this approach to controlling a blowout. What effect would the fire and the oily residue in the smoke plume (which is mutagenic) have on marine mammals, marine birds, and other marine organisms (especially if the residue is water soluble or sinks)?

p. IV-G-1 Marine and Coastal Birds

The discussion of the unavoidable adverse effects to marine and coastal birds understates potential impacts. If a major oil spill were to occur, the impacts could be extremely detrimental. More emphasis must be placed on the seriousness of an oil spill to birds.

p. IV-G-1 Fisheries Resources

The notion that unavoidable oil spill effects could be substantially reduced if oil spill contingency plans were carried out effectively and cleanup techniques were successful is misleading in view of the fact that containment and cleanup effectiveness is completely dependent on favorable weather conditions. Favorable weather conditions are the exception rather than the rule for this basin.

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Response 15-1

An EIS is an "output" of the planning process, not an "input" to the process. The "framing of leasing alternatives" is completed early in the process and stems from an analysis of the information and recommendations provided during scoping. The development of these alternatives is generally based on environmental and management options, which are always developed prior to EIS preparation. Therefore, the statement that the "analysis of impacts . . . is generally inadequate for the framing of alternatives" does not view the planning realities properly.

The area to be offered for leasing was substantially reduced (by 83%); all of the area inside Bristol Bay was eliminated, and a minimum buffer of 18 kilometers (12 nautical miles) was provided between the lease sale area and the Alaska Peninsula. The one deferral (Alternative IV) remaining after the reduction deferred blocks within 25 miles of the Alaska Peninsula and 50 miles of Unimak Pass. This deferral was based largely on scoping recommendations provided by the National Marine Fisheries Service (NMFS), the U.S. Fish and Wildlife Service (FWS), the Natural Resources Defense Council, the Bristol Bay Coastal Resource Service Area (CRSA) Board, and the Aleutians East CRSA Board. Therefore, the MMS has provided full consideration of all concerns expressed for alternatives during scoping. It should be noted that, by reducing the area by 83 percent, the options for additional deferral alternatives also were limited.

Response 15-2

The Alaska Peninsula deferral alternative was identified during scoping to meet concerns for protection of biological resources in the coastal areas along the Alaska Peninsula. The distance of 25 miles was selected to meet most of the concerns identified during scoping (see Sec. I.D.3.). The commentor seems to assert that deferral alternatives should be based on zero risk. This assertion can never be completely satisfied. Even the use of conditional probabilities to justify a larger deferral may be misleading because conditional probabilities assume that a spill occurs at a specified location. As such, these probabilities actually overstate the risk to the nearshore area, because they don't take into account the probability of a discovery or the probability of a spill occurring and contacting the nearshore when vulnerable life-stages of important species are present. Therefore, the argument for zero risk using conditional probabilities would not apply in defining areas to be deferred. As stated in Response 15-1 above, the consideration of a deferral alternative is not based on the assessment of effects, but on the justification for its inclusion as developed during scoping. This deferral was selected to extend out to the 70-meter isobath (approximately 25 miles) to provide consideration of the potential for protection of sea otter habitat and to provide a buffer for other sensitive habitats along the shoreline of the Alaska Peninsula.

Response 15-3

This concern is addressed in Response 15-2.

Response 15-4

The FWS requested a deferral of blocks in water depths less than 70 meters to provide consideration for protection of sea otter habitat. Alternative IV (Alaska Peninsula Deferral) eliminates the majority of blocks in water depths less than 70 meters. Water depths in the Alternative IV area range from 40 to 100 meters, with only a small portion of the eastern part of the alternative area containing water depths between 40 and 70 meters. Alternative IV generally complies with the FWS request for an alternative. The FWS also requested a deferral of all blocks within 12 nautical miles of the Alaska Peninsula, and Alternative IV complies with this request.

Response 15-5

The mean conditional resource estimate for Alternative IV has been revised in Table II-1 and Table IV-8. Assumptions used for the analysis of effects and the Oil Spill Risk Analysis for Alternative IV are now based on the revised conditional resource estimate for this Alternative (331 MMbbls).

Response 15-6

Where detailed comments by the Environmental Protection Agency (EPA) have revealed relevant information, particularly with regard to oil-spill effects, revisions have been made to the FEIS.

Response 15-7

The descriptors (major, moderate, minor, negligible) are not used in a way that understates effects by "averaging" effects of the various activities associated with development, or by "averaging" over species. The approach used in the EIS employs a systematic method of examining effects on a species or species group from each effect-producing activity (oil spill, noise/disturbance, drilling discharges, etc.), and then examines effects from these activities in the aggregate. This is done in such a way that the conclusion on any species or species group can be no lower than the highest rating from any of the effects produced by any individual effect-producing activity. This can in no way be considered "averaging." This concern also is addressed in Response 15-18.

Response 15-8

Indirect effects from loss of food organisms (prey species) in Section IV also are discussed for each major resource. In addition, a general discussion of effects of oil on the ecosystem has been included in the FEIS at the beginning of Section IV.B. The discussions of indirect effects on the various fisheries resources (Sec. IV.B.1.a.(1)) generally concluded that loss of prey organisms from oil spills would be localized and would produce a minimal effect on regional populations. Most pelagic species (salmon, forage fish, and groundfish) are highly mobile and could move to alternative feeding habitats. Birds could be indirectly affected, should food sources be affected during the nesting period, migration stopover, or in an overwintering area. These conditions could result in decreased reproductive success and survival of local bird populations (Sec. IV.B.1.a.(2)). Discussions of indirect effects on marine mammals (Sec. IV.B.1.a.(3)) concluded that sea otters and walrus would be vulnerable to local effects, because their food sources (primarily sedentary benthic organisms) would be most susceptible from oil contamination in bottom sediments. Other pinnipeds are more versatile in their feeding habits and preferences and would therefore not be affected by localized food reductions. Discussions of indirect effects on cetaceans (both endangered and nonendangered) concluded that "it is unlikely that whales would be adversely affected by changes in food resources, as they have various food habitats and are widely distributed in the lease area (Sec's. IV.B.1.a.(4) and IV.B.1.a. (5)). The EIS does not "generally assume that alternative feeding habitat is available," but states it as a matter of fact where it applies. For most species, their migratory behavior implies that their feeding habitats are extensive. Where it is not, such as with sea otters and walrus, the EIS makes this clear.

Response 15-9

The MMS acknowledges that no trajectory modeling was done for the southern side of the Alaska Peninsula. Therefore, a conditional analysis was performed for oil-spill effects for each resource of concern. Basically, an assumption was made that an oil spill could occur along the hypothetical tanker route from Balboa Bay. This assessment of effects (in Sec. IV.B.) assumed that the spill occurred and contacted the resources of concern during their most vulnerable period. Descriptions of the biological resources along the southern side of the Alaska Peninsula are provided in appropriate subsections of Section III.B.

Response 15-10

The MMS disagrees with the EPA's rating on this EIS regarding both the methods used to reach a rating and the statements made concerning the adequacy of this EIS.

There is only one federal standard on EIS adequacy--the CEQ Regulations. The criteria for an EIS in those regulations govern what needs to be considered and how it needs to be considered to be objective, complete, and adequate for decisionmaking. If EPA wishes to evaluate the adequacy of EIS's, it should do so consistently and it should specify the elements used in reaching a rating, with a full explanation of why a rating of "adequate" or "inadequate" was reached.

This EIS has revealed the substance of likely environmental effects, has analyzed in depth the relevant facts, and has drawn from them a realistic assessment of the degree of effect considered potentially possible. the philosophy of the analysis is to emphasize a conservative approach to insure that the outcomes are fully evaluated. These analyses consider regional and localized effects, which are gauged by an objective system (defined in advance) on a scale consistently applied. When the MMS receives a substitute analysis for a potential effect which can be rigorously, consistently, and objectively applied, we will give it full and objective consideration and use it if the facts warrant. Meanwhile, we do not share EPA's view that this EIS is "inadequate."

Response 15-11

The oil-spill-risk analysis for the proposal is provided for the southern side of the Alaska Peninsula in Section IV.A.3.c. The cumulative analysis no longer postulates that oil from other sales would be transshipped at Balboa Bay. The analysis for the proposal discusses potential spills from tankers leaving Balboa Bay but does not provide a trajectory analysis of at-sea tanker spills south of Balboa Bay. A generic discussion of tanker routes from the Bering Sea to market was provided in the Sale 70 FEIS as Appendix I; this discussion is incorporated herein and in Section IV.A.3.c. by reference. In summary, Bering Sea oil finds are expected to supplement Prudhoe Bay crude deliveries to the U.S. West Coast, Gulf Coast, and East Coast. Note that the 28-percent chance of at least 1 at-sea tanker spill of 1,000 barrels or greater south of Balboa Bay (discussed in Sec. IV.A.3.c.) is for the entire tanker route, which extends for thousands of kilometers south of Balboa Bay; perhaps all of the way to the U.S. East Coast. There is a 72-percent chance that no such tanker spill would occur. The likelihood that such a spill would occur anywhere near the southern side of the Alaskan Peninsula is much less than the chance of such a tanker spill occurring along the tanker route.

Balboa Bay lies outside of both the North Aleutian Basin and the boundaries of the Chukchi/Bering Sea regional-oil-spill model used by the MMS. There is no equivalent model available for the southern side of the Alaska Peninsula. Transportation scenarios are very tenuous because transportation routing depends on how much and exactly where oil is found--if it is found. A detailed analysis of transportation alternatives is more appropriately left to a developmental EIS, when the "if," "where," and "how much" would be known.

A trajectory model for the southern side of the Alaska Peninsula is under development for use in analysis of the proposed Shumagin Basin (Sale 86). Tankering of North Aleutian Basin oil would be considered as part of the cumulative case for proposed Sale 86.

The oil-spill-risk analysis assumes that half of the projected at-sea tanker spillage occurs within the model area--the Bering and Chukchi Seas. However, the lengths of tanker routes outside the model area are much greater than their lengths within the model area, potentially extending as far as the U.S. East Coast. Thus, the MMS is overestimating, rather than underestimating, the at-sea risk of spills from tankers within the model area.

Response 15-12

In the period between publication of the Sale 89 DEIS and the Sale 92 DEIS, the MMS revised its resource estimates for past and proposed Bering Sea oil and gas lease sales. The new resource estimates were used in the Sale 92 DEIS and are used in the Sale 89 and Sale 92 FEIS's. In addition, because the originally proposed sale date for the Norton Basin Sale 100 was within 4 months of that of Sale 92, the cumulative case for the Sale 92 EIS includes proposed Sale 100.

Response 15-13

This concern is addressed in Response 15-12.

Response 15-14

The MMS treats major spills as a Poisson process: spills are independent, random, and rare events. In the past, most major OCS-pipeline spills have been caused by anchor dragging, but this will not necessarily be so in the future. The types of spills that have been experienced are those that are guarded against in the future. It is the unexpected spill that is the more likely to occur.

In particular, in this EIS the pipeline to Port Moller is assumed to be buried; to some extent this would protect the pipeline from anchor dragging. Other mitigation, such as armoring or traffic regulations, no-anchoring zones, or a proper siting of the pipeline routes also would mitigate risk.

This EIS projects that only a short length of pipeline (190 km) would be constructed under the proposed action (Table IV-1). Thus, the pipeline in the North Aleutian Basin is likely to be shorter than most Gulf of Mexico pipelines.

Response 15-15

Compared to the environment of land pipelines, all marine-pipeline environments are mild. There are no high winds and no temperatures that change by tens of degrees daily or seasonally. At the ocean bottom, water temperatures and weather are relatively constant. The extremes in environment at the sea bottom are less severe in all oceans than are seasonal extremes at almost any single land-pipeline site. However, in any legitimate comparison of sea-bottom environments, the Cook Inlet environment would have to be considered far harsher than that of the North Sea or Bristol Bay because of the tremendous tidal currents in the inlet.

The MMS contractors have attempted to obtain equivalent North Sea oil-spill statistics but were unsuccessful. If the data can be located and compiled by the commentor, the MMS would still be interested in the suggested comparison.

Table IV-7 was constructed using MMS statistics per the discussion in Section IV.A.3.b. Observed spills resulting from Prudhoe Bay/Kuparuk development, production, and transportation are summed in the column "observed." A similar tabulation was done for observed Cook Inlet spills. Note that the two imaginary spills added to the Cook Inlet observed record by the commentor's consultant are not included in this total. This may explain the commentor's confusion regarding how the table was constructed.

The projected or, in this case, "hindcasted" spillage was calculated from the spill rates given in Table IV-6 for both pipelines, Prudhoe Bay/Kuparuk platforms and tankers, and post-1973 Cook Inlet platforms and tankers. The earlier Cook Inlet platform and tanker data predate the trend in decreased spillage noted for these categories in Section IV.A.3.b. Spillage over earlier years must be projected from pretrend spill rates (2.05 spills of 1,000 barrels or more per billion barrels for platforms, and 3.87 spills per billion barrels for tankers).

No anchor-dragging spills have occurred in Cook Inlet, an area with high fishing effort and also with the greatest commercial-traffic density in Alaskan waters, despite production to date of more than twice the volume of oil expected from proposed Sale 92.

Response 15-16

Spills within Unimak Pass are included in the oil-spill-risk analysis (Launch Point E24 in Graphic 5). The concern for spills south of Unimak Pass is addressed in Response 4-14.

Response 15-17

The analyses of biological resources in the EIS place primary emphasis on direct effects to important resources because these are

believed to be the most severe, and could have a lasting effect on a particular population. Losses of food supplies and the implications on the predator population's viability also are addressed in these assessments. For an additional discussion of the analytical approach in the EIS, refer to Response 15-8.

Response 15-18

The descriptors (major, moderate, minor, negligible) are not used in a way that understates effects by "averaging" effects of the various activities associated with development, or by "averaging" over species. The approach used in the EIS employs a systematic method of examining effects on a species or species group from each effect-producing activity (oil spills, noise/disturbance, drilling discharges, etc.) and then examines effects from these activities in the aggregate against a consistently applied scale. That scale is the set of definitions provided in Table S-2. The assessment is made in such a way that the conclusion on any species or species group can be no lower than the highest rating from any of the effects produced by any individual effect- producing activity. This can in no way be considered "averaging."

In the example given, the commentor implies that the MMS concludes that, if seismic activity results in a negligible effect, discharges result in a minor effect, and oil spills result in a moderate effect on a particular fish resource, the overall effect is considered minor. The EIS, however, does not average the magnitudes of different activities associated with oil and gas operations to produce a mathematical mean. The overall level of effect cannot be any lower than the maximum effect of any single type of activity (seismic, discharges, oil spills).

An example from Section IV.B.1.a. (Fisheries Resources) of the DEIS is used to explain how the bottomline conclusion was derived. For salmon, the most likely effects from seismic activity, discharges, and oil spills would be negligible, minor, and minor, respectively. The bottomline conclusion is that the aggregate effects of lease-sale activities on salmon are expected to be minor. In the event that an oil spill contacted nearshore areas (i.e., Port Moller) when all lifestages were present, a moderate effect could result (i.e., from oil spills) which, in conjunction with negligible seismic effects and minor discharge effects, would result in a moderate overall effect.

The EIS does not summarize effects over several different species. In the example given concerning crabs and other invertebrates, the analysis is based on the set of circumstances most likely to occur and their associated effects, and concludes that the overall effect would be minor. However, if a major oil spill occurred and contacted the Port Moller/Port Heiden area when ovigerous females, larvae, and juvenile red king crab were present, a major effect on this species could result. The EIS examines unlikely possibilities, such as indicated above, to give the reader an indication of what the effect level could be in a given situation. The bottom-line conclusion, however, considers the effects of the most likely set of events expected to occur.

The effect levels for biological resources are based on the effect definitions (Table S-2) and focus on regional populations. The EIS analysis considers localized effects and relates them to the effect on the regional population. This does not constitute an averaging of effects.

Response 15-19

The approach suggested by EPA in this comment is precisely the approach followed in the EIS. Generally, conclusions concerning effects are reached by analysis, and an assessment of the probability of the effect's occurrence follows. However, a preliminary step is sometimes taken to enable analysts to better focus their effects assessments on activities, events, and locations that have reasonable expectations of occurrence. For example, a review of the oil-spill-risk probabilities may reveal biological targets that have extremely low, or negligible risks of contact by a spill. This review would then assist the analyst in dismissing these areas from lengthy assessments, allowing a better/sharper focus on effects that have a possibility of occurrence. This allows the analysis to better answer the question, "What effects are expected from leasing in the Sale 92 area?" The MMS believes that this approach enhances better decisions, which is precisely the purpose of the EIS analysis.

Concerning the method of presentation, the EIS does not average effects ("weighting various sources of impacts by probability and summing over the resource"). Each analysis attempts to project what is likely to occur, and in most instances overestimates potential effects. In addition, effects on various resources that are unlikely to occur also are presented, as well as the circumstances or conditions that would need to be in place for their occurrence. Therefore, the EIS presents a range of potential effects. This actually enhances the ability of the decisionmaker and public to reach their own judgments regarding the acceptability of risks to biological targets.

Response 15-20

The FEIS has been amended to include a more in-depth analysis of pipelines and port facilities. The effects of these development activities have been analyzed for fisheries resources (Sec. IV.B.1.a.(1)), subsistence-use patterns (Sec. IV.B.1.b.(4)), water quality (Sec. IV.F.1.a.), air quality (Sec. IV.F.2.a.), cultural resources (Sec. IV.F.3.a.), transportation systems (Sec. IV.F.4.a.), land-use plans (Sec. IV.F.5.a.), and terrestrial mammals (Sec. IV.F.6.a.).

Response 15-21

Ocean Discharge Criteria Evaluations (ODCE) conducted for the EPA (i.e., Jones and Stokes Associates, 1983) state that deliberate discharges other than drilling fluids and formation waters are expected to have negligible effects on water quality in the Alaskan OCS. In addition, the EPA is required to regulate all of the discharges listed in this comment so that no environmental harm occurs. The EIS is required to assume that the EPA will meet this obligation and that the EPA will ensure that, under the Clean Water Act, effects on water quality are within the limits allowed.

Response 15-22

At any specific location, pipeline construction is not sustained; it is less than episodic--it occurs briefly, once. Operations continue once the pipeline is in place.

Detailed screening analyses obviously must be done at the time when site-specific information is available on the size of plants, discharges, construction, and operation activities. Such an analysis would occur in environmental assessments of any production, construction, and operation activities. Such an analysis is dependent upon the information contained in the production ODCE that the EPA has yet to complete for this sale area. That information will be available for the development/production stage and will be examined in an EIS or environmental assessment prepared at that time. The CEQ regulations (40 CFR 1502.20) encourage the "tiering" of environmental analysis in EIS's.

Response 15-23

The analysis of production- and construction-stage discharges in Section IV.F.1. is complete and concise and summarizes the information available on production discharges at this early, prelease stage. Further analysis will occur in environmental assessments of individual exploration and development plans. A discussion on the fate and behavior of oil is provided in Section IV.A.3.d. of the EIS.

Detailed analyses of production discharges are the responsibility of the EPA, not the MMS. The EIS analysis is required to assume that all existing laws and regulations are followed. The EPA is required to conduct ODCE and NPDES analyses for discharges from development, construction, and production activities in order for the EPA to ensure that no significant degradation of water quality would occur from such activities. The EIS must assume that the EPA meets its legally mandated responsibilities and, therefore, must assume that no significant degradation of the environment would occur.

Response 15-24

The assumption that production drilling would result in the discharge and deposition of substantial quantities of drilling mud is unfounded. In developing estimates of mud solids used and discharged during production drilling, the MMS assumes that mud solids would be recycled among all wells drilled from a single platform. During the drilling process, it is assumed that about 11 percent of the total mud solids used per well would be lost in the well bore. As a result of the continual recycling of muds for all development wells, the actual amount of mud solids discharged to the environment per platform equals about 90 percent of the amount used for the last well drilled.

Based on those assumptions, about 1,200 tons of mud solids would be lost to the environment as a result of drilling 32 oil- and gas-production wells from two platforms. The quantity of mud solids lost to the environment during production drilling (1,200 tons) is substantially less than the quantity discharged during exploration and delineation drilling (3,500-7,000 tons). Therefore, bioaccumulation of heavy metals would be less of a problem during production than during exploration, which the commentor states is a nonproblem.

The portions of the North Aleutian Basin Planning Area that have low current velocities are not within the proposed lease sale area. The offshore North Aleutian Basin containing the proposed offering is a high-energy, nondepositional shelf (Thorsteinson, 1984); thus, drilling muds would not accumulate.

As a result, the MMS believes that, because of the relatively small amounts involved, sufficient information exists to substantiate a "minor" level of effects for the development and production phase, and no further analysis is required.

Response 15-25

NPDES discharge of formation waters is regulated by the EPA through its permitting process. Industry is required to obtain this NPDES production-discharge permit prior to legal discharge. A permit cannot be issued without the submission of information from industry regarding the composition of formation waters in the lease area. If the chemical composition of formation waters appreciably harmed the environment, the EPA would not allow discharge and would probably require that formation waters be reinjected into the formation.

Response 15-26

Dispersion characteristics of the water column in the study area are well known from Cline (1981) and other sources. As stated in Section IV.F.1., concentrations of hydrocarbons (or other pollutants) would decrease tenfold within a few kilometers.

A complete analysis of dispersion of produced waters obviously must await discovery of an oil or gas field, from which formation waters might be produced. The EPA must perform an ODCE prior to permitting any discharges of produced waters. If such waters have appreciable toxicity, the EPA could prohibit their discharge and require that produced waters be reinjected into the formation. In any case, the EPA has the legal responsibility to ensure that no significant degradation of the environment would occur if such discharges were permitted. The EIS analysis is required to assume that all relevant laws and regulations are observed. Thus, the EIS must assume that the EPA would not allow discharges of produced waters if significant degradation of the environment were the result.

Response 15-27

The MMS has not found significant environmental data gaps or scientific uncertainty in relevant information for the proposed Sale 92 area that is essential to a reasoned choice among alternatives, and that precludes analysis of the environmental effects of the proposed sale. Obviously, additional site-specific data would be collected for the site-specific environmental assessment of oil and gas production, if commercial quantities of oil and gas were found.

If commercial quantities of hydrocarbons were found and the EPA considered the data base existing at that future time to be insufficient to permit production discharges, the EPA has the legal responsibility to collect more data, to require that the developer provide more data, to monitor discharges to ensure that degradation of the environment does not occur, or to prohibit discharges. Whichever choice the EPA makes, the EIS analysis must assume that the EPA fulfills its legal responsibilities and does not permit discharges that would significantly degrade the environment.

Response 15-28

The listed levels of effects include both exploration and production phases over the life of the field. The analysis in the EIS is based on the proposal's effect on regional water quality; the yardstick used to evaluate the effects are the definitions provided in Table S-1. Under the proposed action, only two platforms are anticipated; the effects of platform discharges would contaminate less than 1 square kilometer during the production phase and therefore would be minor. Also, only 1 oil spill of 1,000 barrels or greater is anticipated. The MMS agrees that these discharges would have serious effects on a localized area, but, in the context of regional water quality in the southeastern Bering Sea, the effects would be minor. The basis for these determinations for water quality is provided in Section IV.F.1. (also see Responses 15-21, 15-22, 15-23, 15-26, and 15-27).

Response 15-29

The text has been changed to refer to "nitrogen oxides" rather than "nitrous oxides" (see Sec. IV.F.1. of the FEIS).

Response 15-30

The estimates made for potential emissions from offshore oil operations include total suspended particulates. Secondary development that might emit particulate matter would be comparatively miniscule.

Particulate matter from any burning of oil stocks would be short-term and localized, making "cumulative" effects on seasonal snowpacks unfeasible. Any particulate matter from wood stoves would require that firewood be shipped into the area at considerable expense. During the winter on the North Slope, particulate matter is an arctic atomspheric circulation phenomenon (i.e., north of the Brooks Range), which does not extend to the area of the North Aleutian Basin.

Response 15-31

The EIS does not conclude that violations of air-quality standards are impossible if operators are concentrated in that area of the sale-area boundary nearest the shore (18 km from shore). Prior to exploration, it is not possible to designate where the "most likely development locations" will be found. If it were possible, the MMS exemption criteria would be greater than for the case given in the EIS. In other words, standards violations under MMS regulations (30 CFR 250.57) would be even less likely. Those regulations will be enforced to ensure that no violations exist.

The North Aleutian Basin has neither the abundance of meteorological data nor the existing quality problems of the California OCS. The EPA has classified air quality in the area as pristine. Because of the low probability of air-quality-standards violations in the area, and the absence of specific information on equipment locations and configurations, it is not productive to run an air-quality-screening model. In any event, effects on air quality would be investigated further for permitting purposes before any operations began, in accordance with MMS, EPA, and state regulations.

Response 15-32

The analysis of potential air quality demonstrates that air-quality standards might be violated if all operations were concentrated in the nearshore area. This is not likely to be the case. Additionally, operating permits would require emissions to meet standards under MMS regulations, 30 CFR 250.57. Therefore, it is appropriate to classify potential effects on air quality as minor.

Response 15-33

If an LNG plant and tankering facility were constructed onshore, the federal and state agencies responsible for permitting would require the site-specific risk and emissions analysis mentioned in this comment prior to any construction and operations. Seismic risk is inherent throughout much of the western United States. There is no reason why seismic risk in Alaska cannot be evaluated at the production-design phase, as it is elsewhere. The specific data needed for the analysis would not be available until the design phase occurred.

Response 15-34

This concern is addressed in Response 15-17.

Response 15-35

The spreading of a 100,000-barrel oil spill to cover a 200-square-kilometer area is addressed in Response 4-5. The fact that some fisheries resources may be highly concentrated in specific areas is acknowledged in the text and was considered in the analysis of the potential effects of an oil spill on each species group. This concern also is addressed in Response 4-8.

Response 15-36

Effects analysis and the conclusions reached in the text are not based solely on the feasibility of oil-spill cleanup. The analysis and conclusions also take into consideration projected oil-spill frequency, volumes, weathering, and physical and chemical alterations in spilled oil in Bering Sea areas.

Response 15-37

The EIS does not assume that species with demersal eggs do not have narrowly restricted spawning-habitat requirements. The effects of discharges on demersal eggs would be limited to the area around the discharge in which sediments accumulate.

Response 15-38

Exposure times have been added to Table IV-13. This table, summarized from Thorsteinson and Thorsteinson (1982), presents information compiled from various species (some, but not all, of which occur specifically in the lease sale area) for each species group to give a generalized range of LC_{50} values. It is acknowledged that great variation in sensitivities occurs among organisms of the same genus and among individuals of the same species. Applicability of these values also is limited because they represent results from laboratory tests that are not expected to be the same as results in the marine environment. Recognizing all these inherent limitations, the analysis applied the general ranges of LC_{50} values to illustrate what effects might be expected given various situations in the marine environment. The LC_{50} values are not used as threshold values to attempt to predict precise effects.

Response 15-39

The effects definitions apply to regional populations; and the DEIS analysis did not state that a localized portion of the population would experience a moderate effect. The FEIS acknowledges, however, that a localized effect of an oil spill could result in a serious loss of stocks from the drainage(s) contacted. Overall, the effects of this project (including 1 offshore oil spill of 1,000 barrels or greater) are not expected to exceed minor for regional populations of salmon species.

Response 15-40

The text has been expanded to address this concern (see Sec. IV.B.1.a.(1) in the FEIS).

Response 15-41

The text has been expanded to address this concern (see Sec. IV.B.1.a.(1) in the FEIS).

Response 15-42

The effects of the insoluble fractions of petroleum hydrocarbons that enter the benthos, and their potential to affect groundfish, are discussed in Section IV.B.1.a.(1).

Response 15-43

The text has been amended to address this concern (see Sec. IV.B.1.a.(1) of the FEIS).

Response 15-44

This concern is addressed in Response 15-19.

Response 15-45

The other land segments (other than Port Moller) do not show significant reductions in risk from oil-spill contact in Alternative IV, because they are already at low or negligible risks from the proposal. Therefore, no significant change in risk to these land segments is identified in Tables G-10 and G-26 of Appendix G.

Response 15-46

The major threat to red king crab is based on a set of contingent conditions that have a low probability of occurrence. This is explained in the analysis. This conclusion is based on these conditions occurring, in spite of the probability of their occurrence. While Alternative IV reduces the risk, a major effect could still occur as discussed for Alternative I, and the risk would still be low.

The commentor seems to be arguing that a reduction in risk (probability of oil-spill contact) from Alternative IV should produce a reduction in magnitude of effect. Earlier in the letter, the commentor argued against this approach (refer to Comment and Response 15-19). The MMS agrees that probability does not equate with level of effect.

Response 15-47

"Major effect" refers to an analytical term defined in Table S-2 that deals specifically with the area occupied by the population affected and the duration of the recovery period. The conclusion that major effects could occur in a specific area does not necessarily imply that this is a result of a "worst-case" event. Mortality of several thousand birds at a large seabird colony is not likely to result in a major effect; nor are long-term effects likely to result from 1 tanker or pipeline spill (either from habitat degradation or food losses). The circumstances that could result in a major effect are discussed at several points in the analysis. The potential effect of a large spill in Port Moller and in the Shumagin Islands is discussed in Section IV.B.1.a.(2). The assumptions made essentially define a worst-case scenario in these two situations. In the case of the Shumagin Islands, an 80,000-barrel tanker capacity is projected for service in Balboa Bay and all is assumed to be released from a grounded tanker. In Port Moller, a 7,500-barrel pipeline release is discussed, since that is the average spill quantity for OCS incidents of this type. A worst-case analysis of a 100,000-barrel oil spill has been incorporated into Section IV.J.3. of the FEIS.

Response 15-48

Definitions describing effects on biological resources are designed to be broad and general in order to allow a large degree of flexibility when assessing effects on a particular population. Each analyst is required to assess the effects of each species or species group and then "fit" the specific conclusion into one of the defined levels of effects. Therefore, the definitions are appropriate for both groups (endangered and nonendangered cetaceans). In quantitative terms, effects on a population of endangered whales may not need to be very large to move to a higher level on the scale of effects, while effects on nonendangered whales may need to be greater to achieve the same effect level. Therefore, the MMS does not agree that a different set of definitions is absolutely necessary for each of the two groups.

Response 15-49a

The use of the average high-density index of four to seven sea otters per square kilometer is realistic in evaluating the effects of oil spills contacting sea otter high-use habitats in the proposed lease sale area. Rafts of sea otters with 1,000 individuals do occur, but they are very uncommon or rare, while rafts or groups of 20 to 100 or more sea otters are fairly common but widespread. Within a 100-km^2 area, where the assumed spill spread may occur, one but no more than two rafts of 100 or more sea otters are likely to be present, along with smaller rafts of, for example, 20 sea otters. Thus, the estimate of 400 to 700 sea otters contaminated by the spill is a reasonable and realistic estimate of a likely number of sea otters that would be affected by the spill. For further discussion of this concern, also see Response 6-13.

Response 15-49b

The EIS emphasizes floating oil slicks when discussing effects on marine mammals, because floating slicks are more hazardous to marine mammals than dissolved hydrocarbons in the water column or tar balls. A discussion of the fate and behavior of spilled oil is presented in Section IV.A.3.d. Type and concentrations of dispersed and dissolved oil, and persistence of tar balls, are discussed in this section. Effects of ingestion of oil by cetaceans and pinnipeds (particularly gray whales and walrus) are discussed in Sections IV.B.1.a.(3) and IV.B.1.a.(4) (of the FEIS).

Response 15-49c

The text correctly states that "The whales came as close as 5 km to the airguns before some behavioral changes were noted." Changes in direction and swimming characteristics were observed at 1.6 and 0.84 kilometers. The tolerance mentioned earlier applies to the

general population trend and not to the experiments conducted by Bolt, Baranek, and Newman. A thorough reading of Section IV.B.1.d. of the DEIS supports the conclusion, which is based on the probability of occurrence of whales in the lease sale area and of seismic activities in the lease sale area. Seismic activity has been demonstrated to alter migrations only during close airgun experiments, as stated in the text.

Response 15-50a

The text does not state that most nonendangered cetaceans eat zooplankton, but rather states that "The toothed nonendangered cetaceans feed mainly on finfish."

When the probability of oil contacting biological-resource targets even after 30 days is generally less than 0.5 percent, this supports the statement that interactions are unlikely. Therefore, if interactions are unlikely, the effects on cetaceans probably would not be significant.

Response 15-50b

This concern is addressed in Response 15-50a.

Response 15-51

OCS activities would not have a major effect on right whales because the majority of the population historically uses the Gulf of Alaska. Most of the current sightings (from 1935 to present) were recorded in the Gulf of Alaska area. The minor level of effects is based on the fact that there is an extremely low probability of a right whale being present in the North Aleutian Basin and also interacting with OCS activities. Since the North Pacific right whale population may already be biologically extinct (Braham and Dahlheim, 1981), the effects of an adverse interaction between right whales and OCS activities in the North Aleutian Basin may not affect the regional population, because the few right whales in the North Aleutian Basin might not interact with right whales in other areas.

Response 15-52

The legend in Graphic 4 indicates that the shaded area is the "most probable occurrence of humpback and fin whales." The text (Sec. III.B.4. of the FEIS) has been amended to indicate the infrequency with which fin whales have been sighted in the lease sale area. The probabilities of spill contact refer to targets (which may be used by more than one species), not to whales; therefore, similar contact probabilities could apply to both gray and fin whales.

Response 15-53a

The MMS does not agree with the comment that baleen whales feed only during the summer. Recent data (Jones et al., 1984; Thompson, 1984) indicate that bowhead whales feed during the fall migration and somewhat during the spring migration. This also has been found to occur for gray whales during migration periods. This also may occur for other baleen whales on their migrations.

Response 15-53b

The seasonal spawning-foraging migrations of a number of groundfish species of the eastern Bering Sea--halibut, yellowfin sole, pollock, and other flounders--tend toward the inner areas of Bristol Bay in some part, and away from areas that oil spills might reach. These migrations also occur in deep waters, where the probability of contact by the water-soluble fractions of an oil spill would be low. Considering the extent of an oil spill compared to the entire area over which these fish migrate, an insignificant segment of these populations would be in the vicinity of an oil spill and its likely trajectory if it occurred. Section IV.B.1.a.(2)(c) of the DEIS concludes that adults are subject to little hazard from offshore oil and gas operations.

Response 15-54a

A Bering Sea surf clam fishery may have economic viability only in the event that commercial clam fisheries decline elsewhere. It does not appear that Bering Sea snail resources, which now support a small-scale commercial fishery by the Japanese in the Bering Sea, would prove a viable alternative commercial effort for domestic fishermen. The text (Sec. III.C.1.d. of the FEIS) has been amended to include information on the Japanese snail fishery, and Section IV.B.1.b.(1) assesses the potential effects of the proposed action. Commercial fisheries for pandalid shrimp are not operational at this time. Bering Sea shrimp resources are depressed, and there is no commercial fishery. The results of effects studies of oil on shrimp resources are discussed in the FEIS.

Recreational fishing for salmon in the Bristol Bay region is a valued use of the salmon resource, and the numbers of sport fishermen and benefits to the Alaskan economy are growing. Given the expected minimal loss of immature and/or adult salmon resulting from an oil spill or spills, perhaps at most a few hundred immatures and lesser numbers of adults would be affected. When compared with the total stream escapement, there should be no perceptible loss to the sport fishery.

It does not seem probable that salmon flesh would be tainted by contact with oil spills, given the proclivity for the fish to avoid

even very small concentrations of hydrocarbons in the water column, as shown by laboratory studies that are discussed and referenced in this EIS. Even if salmon were contaminated by oil in the marine environment, some time and distance would elapse before entry to the sport fishery of Bristol Bay; and this should allow physiological removal of hydrocarbon fractions from tissues.

Response 15-54b

Based on available information from Effects of Petroleum on Arctic and Subarctic Marine Environments and Organisms, Vol. 1., "Nature and Fate of Petroleum," edited by Donald C. Malins, the residual period of oil residue in seawater is dependent on a number of variables, including type of oil, temperature, wind conditions, light, salinity, oxygen, spreading, evaporation, dissolution, emulsification, sedimentation, and microbiological and chemical factors. Therefore, prediction of a period when residual oil would be in Bering Sea waters is a gross estimate, at best. The OSRA is programmed on the basis that oil spills in the offshore pelagic waters no longer have lethal or sublethal effects after 30 days. This would then seem to be the upper limit for the presence of residual oil in seawater.

During the "Proceedings of a Synthesis Meeting: The North Aleutian Shelf Environment and Possible Consequences of Offshore Oil and Gas Development," (Anchorage, Alaska, March 9-11, 1982, Outer Continental Shelf Environmental Assessment Program), it was stated:

> If an oil similar to Prudhoe Bay crude oil is spilled on the North Aleutian Shelf under typical summer conditions, approximately 11% of the spilled oil would have evaporated and 5% would have entered the water column within 24 hours of the spill. By 10 days, when partitioning is almost complete, 17% would have evaporated, 55% would remain in the slick, and 28% would be dispered in the water column. At this point (10 days) almost all of the volatile components, including many of the toxic components, would have evaporated. In fact, most of the volatile compounds would be gone from the slick and from the water column within 4 days (100 hrs). Alternately, and very possibly, the spilled oil would form a stable water in-oil emulsion (mousse) within 48 hrs, at which point any further partitioning would be dramatically decreased.

It would seem then that oil residues would remain in the water column, where they might contact captured crabs for up to 10 days.

Response 15-55

The text (Sec. IV.B.1.a.(1) of the FEIS) has been amended to delete estimates of king-crab-catch loss from pipelines and platforms for the following reasons. The crab fishery is a pot fishery, and the presence of pipelines and platforms would not close this large an area to this type of fishing gear or cause subsequent catch loss. Crab pots may be laid proximate to these offshore structures without undue hazard or loss of catch; indeed, the structures may prove attractive to shellfish, with a resulting increase in catch.

Response 15-56

This statement has been rewritten (see Sec. IV.B.1.a.(1) of the FEIS) to conclude that the effect of an oil spill on red king crab off Port Moller would be major. The minor effect on salmon, herring, and other forage fishes is based on the limited areal distribution of the 1 projected oil spill of 1,000 barrels or greater over the life of the project. Even if it occurred, the apparent ability of salmonids to detect and avoid very low concentrations of hydrocarbons in seawater would help them avoid the contaminated area.

Salmon migrate through the Port Moller area in only a few days and no documentation exists to support the assertion that immature salmon delay or slow their migration in the Port Moller area, although there is evidence that water temperature influences the migration rate for juveniles.

Response 15-57

When analyzed apart, however, herring and salmon fisheries are of short duration--2 weeks for herring and 8 to 10 weeks for salmon. These fishing seasons also include closed periods, usually weekly during the salmon seasons, and often more than 2 days per week when escapements are low.

Response 15-58

The cumulative-effects section of the commercial-fishing-industry analysis (Sec. IV.B.1.b.(1) of the FEIS) has been amended to indicate that minor effects could occur on the commercial salmon and groundfish industries. Effects on the red king crab fishery would be major and effects on the herring fishery would be moderate.

Oil spills occurring in other OCS areas would have little effect on the fisheries adjacent to the Alaska Peninsula or inner Bristol Bay. The distance of other OCS areas from the latter areas would preclude spills contacting these areas.

Response 15-59

This concern is addressed in Section IV.A.4. and in Response 14-27. In addition, storm tracks and fog are discussed in Section III.A.2. and additional oceanographic discussion and citations have been added to Section III.A.3. of the FEIS.

Response 15-60

Oil production and the hypothesized transportation routes should not be confused. Production from the proposed sale can occur only within the proposed lease sale area. No production would result in Balboa Bay or on the southern side of the Alaska Peninsula. The analysis in the EIS, therefore, concentrates on Bristol Bay.

A port facility is not planned for Balboa Bay; rather, the facility is tenuously assumed only for the purpose of analysis. Any use of Balboa Bay and any tanker routing along the southern side of the Alaska Peninsula would depend upon oil being found, the exact location where oil is found, and how much oil is found. If and when a tanker-port facility is considered for Balboa Bay, a development and/or port EIS would be written to consider the effects projected to occur as a result of the site-specific proposed action.

With no terminal actually proposed, no plans exist that give the location of a terminal or tanker routings within the port area. Therefore, detailed oceanographic information on Balboa Bay would serve no analytical purpose. In the absence of terminal-siting information, it is assumed that a port spill could contact any resource in the vicinity of Balboa Bay.

Ice cover is assumed to occur every winter in the oil-spill-model area, particularly in the Chukchi Sea, but not necessarily in the proposed lease sale area (also see Response 6-111).

Tide and sea-state information relevant to oil behavior and cleanup have been added to Sections IV.A.3. and IV.A.4. of the FEIS (also see Response 14-27).

Response 15-61a

This concern is addressed in Response 6-111.

Response 15-61b

Wind waves will not disperse drilling muds or drill cuttings that reach the ocean floor in the Sale 92 lease area because the water is too deep. About 92 percent of the flow energy in the proposed lease sale area is supplied by wind and other weather phenomena, not tides (see Sec. IV.A.3.). The proposed lease sale area and North Aleutian Shelf are, in general, high-energy areas where any deposition is temporary (Thorsteinson, 1984). Any drilling muds that reached the bottom would be resuspended, diluted, and transported off of the shelf to deeper water.

Because of this resuspension, water-column dispersion of drilling muds and drill cuttings is of very minor concern in this EIS and does not merit further discussion. The EIS analysis assumes that all existing laws and regulations will be followed. These regulations include Ocean Discharge Criteria (40 CFR Section 125.10 et seq.; 45 FR 65942 et seq., October 3, 1980). Discharges of mud and cuttings in the proposed lease sale area will be regulated by the EPA through a general National Pollutant Discharge Elimination System (NPDES) permit. Prior to issuing such a permit, the EPA, under Section 402 of the Clean Water Act (NPDES permits), must complete an Ocean Discharge Criteria Evaluation (ODCE) and make the determination, pursuant to Section 403 of the Clean Water Act, that the proposed discharge would not cause unreasonable degradation to the environment.

Response 15-62

A discussion of how fishes interact with other organisms (in order to produce an assessment of indirect effects) would tend to produce lengthy, academic discussions that would make the EIS a cumbersome, unwieldy document.

The analysis of effects in the EIS does consider probable changes in the ecosystem. The approach in this EIS focuses on changes in important ecosystem components rather than on describing total ecosystem changes by tracking changes or effects through habitat or trophic linkages. Each analysis considers direct effects on these important resources and (if appropriate) indirect effects that could occur from habitat changes and effects on food sources used by these key ecosystem components. This analytical approach is designed to address the significant environmental issues identified during scoping (i.e., the effects on fish, birds, and mammals from activities associated with the proposed action), thereby meeting the requirements of NEPA and providing the Secretary of the Interior with tangible conclusions upon which to base a decision concerning this lease sale. Alternative approaches are extremely complex, difficult to define conceptually, and may prove to be more of an academic exercise than a useful decisionmaking tool.

Response 15-63

The text has identified and summarized the available information on Bering Sea salmon and forage species (Sec. III.B.1.). While there are many uncertainties regarding their ocean distribution and precise spawning locations, there appears to be sufficient information to support the conclusions presented in the EIS. Where uncertainties or unknowns exist, the analytical approach has been to identify the limits and make conservative assumptions regarding the unknown, thereby overestimating effects. For additional discussions on this topic, refer to Responses 1-1 through 1-15.

Response 15-64a

The text has been amended (Sec. IV.B.1.a.(1) of the FEIS) to include information on run size (catch and escapement) for stocks that would potentially be affected by the proposed action.

Response 15-64b

The text has been amended (Sec. IV.B.1.a.(1) of the FEIS) to include a range of run sizes for chinook, pink, and coho salmon for stocks that would potentially be affected by the proposed action.

Response 15-64c

Information from the two referenced NOAA-funded studies has been incorporated in the FEIS (Sec. IV.B.1.a.(1)), where appropriate.

Response 15-65

A general discussion of the effects of oil on the ecosystem has been added to the FEIS (Sec. IV.B.). Anadromous-fish use of streams along the proposed transportation corridor between Herendeen Bay and Balboa Bay has been incorporated into the fisheries resources description (Sec. III.B.1.) and the analysis (Sec. IV.B.1.a.(1)).

Response 15-66a

This concern is addressed in Response 15-62.

Response 15-66b

Pipeline construction would temporarily disturb about 500 acres. Based on experience in other climates, recolonization tends to be rapid. Likewise, shore facilities (an oil terminal would require 25-30 hectares and an LNG plant about 80 hectares) tend to have a minimal effect on marine habitats and invertebrates, provided proper planning, siting, and construction techniques are implemented, and runoff and discharges conform to EPA criteria. In any event, the affected area comprises only a small segment of Port Moller and Balboa Bay. Site-specific analyses would be performed in the event that a discovery is made and development occurs.

Response 15-67

This concern is addressed by Response 15-62.

Response 15-68

Important habitat areas for marine mammals are discussed in appropriate sections of the EIS. Specifically, summer-use areas and migration routes for gray whales are discussed in Section III.B.4.a. Harbor seal haulout areas are discussed in Section III.B.3.

Response 15-69a

The text (Sec. III.C.1. of the FEIS) has been amended to include information on sport fishing for salmon in Bristol Bay and on the Alaska Peninsula.

Response 15-69b

The potential for commercial harvests for shrimp, snails, blue and brown king crab, Korean hair crab, and Alaska surf clam in the lease sale area is not discussed in the EIS because of their noncommercial importance at this time, their abundance, and the assumption that a discussion of effects of the proposed action on related species also would apply to these species.

Bering Sea commercial fisheries for these species are either underdeveloped or very limited. For example, the hair crab may be limited to a few areas off the northern side of the Alaska Peninsula and near the Pribilofs, both well away from the North Aleutian Basin lease sale area. Shrimp, formerly fished northwest of the Pribilofs by the U.S.S.R. and the Japanese and in several Aleutian Island bays by the U.S., no longer support a commercial effort. Blue and brown king crab occur in commercial quantities primarily outside of the lease sale area. The potential for development of a commercial Alaska surf clam fishery is generally contingent on the decline of clam fisheries elsewhere. Because commercial activity for the above species is limited and concern for these species was not raised as an issue during the scoping process, an extensive discussion of the commercial potential for these species relative to this lease sale was not included in the EIS. It is not likely that the effects of this proposed lease sale on these resources would differ significantly from those discussed for the major species of this area.

Response 15-70

Section IV.B.1.b.(1) of the FEIS includes a discussion of the commercial-fisheries resources of Balboa Bay, on the southern side of the Alaska Peninsula.

Response 15-71

The analysis of effects of a pipeline corridor on anadromous and fresh-water fish has been incorporated in Section IV.B.1.a.(1) of the FEIS. The Port Moller/Balboa Bay corridor was selected as a result of analysis of numerous environmental factors and concerns, including potential alternative corridors, as discussed in the Bristol Bay Regional Management Plan (1985).

Response 15-72

The text (Sec. IV.F.1. of the FEIS) has been amended to include an analysis of the effects of construction of a transpeninsula pipeline (Port Moller to Balboa Bay), and an analysis of the effects of a transshipment terminal at Balboa Bay on the water quality of Port Moller, Herendeen Bay, Balboa Bay, and Portage Valley River and Foster Creek. The water-quality data cited by the EPA were requested by the MMS, but were not supplied by the EPA.

Response 15-73

In response to the Call for Information, alternatives to the proposed action are developed from input provided by industry, federal and state agencies, and the public, and from staff input. After block-deferral alternatives are developed, resource estimates are calculated, and the level of industry activity is estimated. Due to this sequence, and based on environmental concerns, it is possible to designate deferral areas that have resource estimates and levels of activity identical to the proposal.

In response to the Call for Information, the Fish and Wildlife Service requested a deferral of all blocks within 12 nautical miles (13.8 miles) of the Alaska Peninsula and in water depths less than 70 meters to afford protection to sea otters in southern Bristol Bay. The Bristol Bay CRSA Board requested a 40-kilometer (25-mile) deferral along the Alaska Peninsula, and the Aleutians East CRSA Board requested a 48-kilometer (30-mile) deferral. These requests were incorporated into Alternative IV (Alaska Peninsula Deferral). After developing this lease sale alternative, the resource estimate for the alternative was assumed to be similar to that for the proposal.

The mean conditional resource estimates for Alternative IV has been revised. The analysis of effects for Alternative IV is now based on this revised resource estimate (331 MMbbls).

Response 15-74

The text has been amended in response to this concern. The FWS request for deferral of blocks with water depths less than 70 meters was incorporated, to a substantial degree, in Alternative IV (Alaska Peninsula Deferral).

Response 15-75

The mean conditional resource estimate for Alternative IV has been revised in Table II-1.

Table IV-8 (Sec. IV.A.3. of the FEIS) has been amended to correspond to the resource estimates identified in Table II-1.

The mean conditional resource estimates for the proposal (364 MMbbls) has been revised since the publication of the Federal Offshore Statistics, September 1984.

Response 15-76

The no-sale case (Alternative II) differs from the delay-the-sale case (Alternative III). Alternative II would cancel the sale, while Alternative III would mean that the sale configuration would remain the same, but would be delayed for a specified period of time (in this case, 5 years). Cancelling the sale would mean that the entire planning process would begin again when the North Aleutian Basin appears on a future 5-year leasing schedule. Alternative II means that the sale, with its particular acreage and configuration, is permanently cancelled. The text has been amended to clarify the descriptions of alternatives.

Response 15-77

The proposal is based on a mean-case exploration and development schedule; it is not a worst case or a maximum case. Worst-case analyses are performed if there is missing information that is essential or important to a decision among alternatives (see Sec. IV.J.3. of the FEIS). The maximum case is discussed in Appendix A.

The FEIS also contains a discussion about the worst-case effects of a 100,000-barrel oil spill (Sec. IV.J.3. of the FEIS). This discussion evaluates a conservative case of a "what-if" (unlikely) situation. The probability of a 100,000-barrel spill occurring is 0.03.

Response 15-78

The MMS feels that an adequate distinction is made between stipulations and ITL's and that the existing format, which includes a stipulation or ITL followed by a purpose statement, does not need further clarification. The NTL's, specific notices issued as orders to lessees under 30 CFR 250.30, are identified as such in Section II.C.1.a. and b. The ITL's are discussed in Section II.C.1.b.(2).

Response 15-79

The orientation program was designed to make workers aware of the special environmental, social, and cultural values of regional residents and the environment. The purpose of the program is to make workers aware of the sensitivity of the environment (biological and social) so that adverse effects can be avoided, rather than remedied after the fact. Stipulation No. 2 (Orientation Program) has been included in the Notice of Sale for previous Alaska OCS lease sales and is supported by the State of Alaska and the industry.

Response 15-80

The MMS is aware of the difference between the words "would" and "could" in respect to evaluating the effectiveness of mitigating measures and has used these terms appropriately in the EIS.

Response 15-81

If any significant biological areas are discovered during the conduct of any operation on the leasehold, the lessee shall immediately report such findings to the MMS Regional Supervisor, Field Operations, and make every effort to preserve and protect the resources.

The Protection of Biological Resources stipulation has been included in the Notice of Sale for all Alaska OCS lease sales, except the Gulf of Alaska sales. This stipulation was included in the Notice of Sale for the Beaufort Sea (Sale 71) to provide protection of the Boulder Patch, a unique biological area. The effectiveness of these measures is addressed in Section II.C.1.c. The MMS is not aware of any failure to protect the resources of concern.

Response 15-82

Stipulation No. 5 (Transportation of Hydrocarbons) does not state that pipelines are environmentally preferable. The stipulation reads as follows: ". . . pipeline will be required: . . . (b) if laying such pipelines is technologically feasible and environmentally preferable; and . . ."

Response 15-83

The EIS concludes that geophysical seismic activities associated with the lease sale are not expected to adversely affect endangered whales. Therefore, a stipulation restricting these activities to winter is unnecessary. In its biological opinion (Appendix H), the NMFS recommends reasonable and prudent alternatives to avoid likely jeopardy to the gray and right whales. The NMFS recommends that the MMS permit deep-seismic (airgun) geophysical surveys in the lease sale area only when the right whale is not present. The NMFS also recommends that no such surveys be conducted near Unimak Pass or along the Alaska Peninsula if the spring and fall migration of the gray whale would be disturbed. The MMS will follow those recommendations through appropriate mitigating measures, including ITL's and NTL's.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest and Alaska Fisheries Center
National Marine Mammal Laboratory
7600 Sand Point Way N.E., Bldg. 4
Seattle, Washington 98115

16

February 12, 1985 F/NWC:MED

Mr. Thomas H. Boyd
EIS Coordinators
Environmental Assessment Section
Minerals Management Service
P.O. Box 101159
Anchorage, AK 99510

Dear Mr. Boyd:

Enclosed, as per your request, are our comments on the Draft Environmental Impact Statement - North Aleutian Basin Sale 92.

If you have any questions, or require additional information, please do not hesitate to contact me.

Sincerely yours,

Howard Braham

Howard Braham, Ph.D.
Director, National
Marine Mammal Laboratory

Enclosure

Fur seals

16-1 Page III B-27

The Pribilof population of northern fur seals is currently estimated at 871,000 or about 72% of the world population. (Ref.: Proceedings of the 27th Annual Meeting of the North Pacific Fur Seal Commission, March 25-30, 1984, Moscow, U.S.S.R.)

Petition has been submitted to list fur seals on Pribilofs as "threatened" under ESA.

16-2 Page IV B-46.

Impact of oil on fur seals seems "down-played". The Kooyman, Gentry and McAlister ref. contains ample information to conclude that oil has a serious effect on fur seals.

16-3 General

Impacts on migratory rates and feeding areas also seem "down-played" for fur seals. There are times of the year when a large oil spill in the Unimak Pass area could affect thousands of seals.

16-4 Page III B-28 Bowhead whale:

For population estimate of approximately 4,000, cite Dronenburg, et al. 1983.

Dronenburg, R. B., G. M. Carroll, D. J. Rugh, and W. M. Marquette. 1983. Report of the 1982 spring bowhead whale census and harvest monitoring including 1981 fall harvest results. Rep. int. Whal. Commn 33:525-537.

ibid For winter distribution of bowhead whales, cite Brueggeman 1982.

Brueggeman, J. J. 1982. Early spring distribution of bowhead whales in the Bering Sea. J. Wildl. Manage. 46(4):1036-1044.

16-5 Page III B-31 (and IV J-2, last paragraph)

First paragraph. Update gray whale population estimate to 17,000 citing Rugh 1984 (which suggests >80% of the population enters the Bering Sea, thus increasing risk considerations)

Rugh, D. J. 1984. Census of gray whales at Unimak Pass, Alaska, November-December 1977-1979. In: M. L. Jones, S. Swartz, and S. Leatherwood (editors), The Gray Whale. Academic Press.

16-6 Page III B-31 (Gray whale section)

Throughout this section references are made to "in press" papers. These papers are now published and should be cited as follows:

1. Braham, H. W. 1984. Distribution and Migration of Gray Whales in Alaska. pp. 249-266.

2. Nerini, M. 1984. A Review of Gray Whale Feeding Ecology. pp. 423-450.

3. Moore, S. E. and D K. Ljungblad. 1984. Gray whales in the Beaufort, Chukchi, and Bering Seas: Distribution and Sound Production. pp. 543-559.

These three articles are published in Jones, M. L., Swartz, S. L. and Leatherwood, S. (editors) in the book entitled "The Gray Whale". Academic Press, Inc., Orlando, Florida.

16-7 Page III B-33. (Killer whale section)

Please cite: Braham and Dahlheim (1982). See enclosed article.

16-8 Page III B-35 (Mesoplodon Section)

Please see enclosed article by Loughlin, Fiscus, Johnson and Rugh, 1982.

16-9 Page IV B-66. The conclusion re: the effects on gray whales seems to be "down-played".

16-10 Page IV B-86. The conclusion re: the effects on non-endangered whales seems to be "down-played". Insufficient data exists on the "non-endangered" cetaceans to draw major conclusions. Extrapolations cannot be made from Mysticete whales to Odontocetes.

16-11 Page III B-24, bottom.

Loughlin, Rugh and Fiscus (1984) have more recent estimates of 240-290,000 (see enclosed article).
Frost et al. (1982) give most recent Bristol Bay sea lion numbers.

16-12 Page III B-25

Paragraph 2 - decline still occurring in eastern Aleutians.
Paragraph 3 - No graph 3.
- No Bristol Bay rookeries.
- The rookeries must include Gulf of Alaska and not relevant for this sale (see attached map in Loughlin et al 1984.
- We question the last sentence: most are present during reproduction period (late May-early July).
Paragraph 4 - Pitcher and Calkins (1981) is more complete reference.
Paragraph 6 - Pitcher, K. W. (1981). Prey of the Steller sea lion, *Eumetopias jubatus*, in the Gulf of Alaska. Fish. Bull. U.S.: 79:467-472.

16-13 Overall - information presented is acceptable, however information could be updated with more recent citations (e.g. sea lion).

(attached reprints have citations for)
Loughlin et al. 1984
Frost et al. 1982
Pitcher and Calkins 1981

Response 16-1

The text has been amended to reflect this concern (see Sec. III.B.3. of the FEIS).

Response 16-2

The EIS states that sea otters, fur seals, and newly born seal pups are likely to suffer direct mortality from oiling through loss of fur/water repellency and subsequent loss of thermal insulation resulting in hypothermia. Kooyman, Gentry, and McAlister (1976) and Costa and Kooyman (1980) were added as citations to this statement.

Response 16-3

This concern is addressed in Response 6-11.

Response 16-4

The text has been amended to reflect this concern (see Sec. III of the FEIS).

Response 16-5

The text has been amended to reflect this concern (see Sec. IV.B.1.a.(4) of the FEIS).

Response 16-6

The text has been amended to reflect this concern (see Sec. IV.B.1.a.(4) of the FEIS).

Response 16-7

The text has been amended to reflect this concern (see Sec. IV.B.1.a.(4) of the FEIS).

Response 16-8

The text has been amended to reflect this concern (see Sec. IV.B.1.a.(4) of the FEIS).

Response 16-9

The effects on a targeted species are determined by the MMS after a review of all available data. The MMS may come to an entirely different conclusion than others reviewing the same data. Considering that only 1 spill of 1,000 barrels or greater is expected to occur over the 26-year life of the field, the probability of that spill is very low. If gray whales did contact that 1 spill, the effects probably would be no greater than the effects on the whales that migrated through the Santa Barbara spill. Although there are data gaps on the effects of oil on whales, a worst-case scenario (Sec. IV.J.) addresses these issues. Therefore, considering the low probability of an oil spill interacting with gray whales and the lack of demonstrated acute effects when gray whales contact oil, the MMS does not consider that effects on gray whales are underestimated (see Sec. IV.B.2.4.).

Response 16-10

This concern is addressed in Response 16-9. As with gray whales, no acute effects have been demonstrated from a nonendangered cetacean/oil-spill interaction. Geraci's and St. Aubin's work with bottlenose dolphins also has demonstrated that effects from oil appear to be short-term and reversible. The MMS does not agree that effects on nonendangered cetaceans are underestimated. The text does not state that extrapolations are made between mysticetes and odontocetes.

Response 16-11

The text has been amended to reflect this concern (see Sec. III.B.3. of the FEIS).

Response 16-12

The text has been amended to reflect this concern (see Sec. III.B.3. of the FEIS).

Response 16-13

The text has been amended to reflect this concern (see Sec. III.B.3. of the FEIS).

(18)

United States Department of the Interior

NATIONAL PARK SERVICE
P.O. BOX 37127
WASHINGTON, D.C. 20013-7127

IN REPLY REFER TO:

L7617(485)

MAR 6 1985

RECEIVED
MAR 12 1985
REGIONAL DIRECTOR, ALASKA OCS
Minerals Management Service
ANCHORAGE, ALASKA

Memorandum

To: Regional Director, Minerals Management Service, Alaska Region

From: Acting Associate Director, Planning and Development

Subject: Draft Environmental Impact Statement (DEIS) for the Proposed Outer Continental Shelf Oil and Gas Lease Sale 92, North Aleutian Basin (DES-85/3)

As requested, we have reviewed the subject document and have the following comments.

Since there is a potential, albeit minor, for adverse direct and indirect impact on cultural resources, we suggest that the proposed action be coordinated with the State Historic Preservation Officer. Also, the Advisory Council on Historic Preservation should be given an opportunity to comment on the undertaking pursuant to Section 106 of the National Historic Preservation Act, as amended.

18-1 We would appreciate your consideration of expanding the assessment of potential impacts to significant natural resources in the DEIS to include the Mount Veniaminof and Shishaldin Volcano National Landmarks. A description of each landmark is enclosed for your information.

Jane W. Stewart
David G. Wright

Enclosures

cc: Director, MMS (MS-644) Reston, VA 22091

Response 18-1

The Advisory Council on Historic Preservation has commented and we have been responsive to and are continuing to consult with the Council and with the State of Alaska State Historic Preservation Office (SHPO). Both volcanoes of concern to the commentor are far from the lease area and over 10 kilometers inland. They are even farther from the development and transportation routes of the proposed action for Sale 92. Therefore, the effects on these landmarks would be negligible. The scoping process for Sale 92 did not identify natural landmarks as an issue of concern. However, these volcanoes are described in the St. George Basin (Sale 70) FEIS, which is incorporated by reference in the cumulative analysis of cultural resources (Sec. IV.F.3. of this FEIS).

(17)

United States Department of the Interior

FISH AND WILDLIFE SERVICE
1011 E. TUDOR RD.
ANCHORAGE, ALASKA 99503

IN REPLY REFER TO:
DTS

Regional Manager
Minerals Management Service
Alaska OCS Region
P.O. Box 10-1159
Anchorage, Alaska 99510

MAR 1 3 1985

Dear Mr. Powers:

The U.S. Fish and Wildlife Service, Alaska Region, has reviewed the Draft Environmental Impact Statement North Aleutian Basin Sale 92. We believe that the statement adequately presents the proposed action and possible alternatives. Overall quality of the document appears to be good with few technical problems.

Some errors were observed, however:

17-1 Page II-C-10. Information on Endangered Whales - There appear to be two similar NTL's where one would suffice.

17-2 Figure III-35. Key, Important, and General Caribou Habitat Distribution - Text accompanying this figure indicates that it shows the general distribution of caribou habitat on the whole Alaska peninsula. However, the figure appears to show only habitat on peninsula refuges.

17-3 Page IV-A-5, Section e. Title of the section implies that estimates of formation water production will be discussed. However, no such discussion is provided.

17-4 Table IV-3. The range of possible produced water amounts seems overly broad relative to estimates of other effluents shown in the table.

The Fish and Wildlife Service appreciates the opportunity to review and comment on this well-crafted document.

Sincerely,

Acting Regional Director

cc: Ray Fritz, WDC

Response 17-1

The two Information to Lessees on Endangered Whales are not redundant--one applies to oil spills and the other applies to noise disturbances.

Response 17-2

Figure III-36 has been amended to identify the general distribution of caribou habitat on the Alaska Peninsula (Sec. III.C.4. of the FEIS).

Response 17-3

The text has been amended to provide a discussion of formation-water estimates (see Sec. IV.B.1.a.(1) of the FEIS).

Response 17-4

Because of the uncertainty in calculating the quantity of formation waters produced from production wells, a range of quantities was given. This uncertainty will exist until wells have been drilled in the lease sale area and precise estimates can be made on the quantity of formation waters produced.

19

United States Department of the Interior

GEOLOGICAL SURVEY
RESTON, VA. 22092

In Reply Refer To:
WGS-Mail Stop 423

MAR 4 1985

Memorandum

To: Regional Director, Minerals Management Service, Alaska Region, Anchorage, Alaska

From: Assistant Director for Engineering Geology

Subject: Review of draft environmental statement for OCS Oil and Gas Lease Sale No. 92, North Aleutian Basin, Offshore Alaska

We have reviewed the draft statement as requested in a memorandum of January 11 from the Director, Minerals Management Service.

19-1 The analysis of the potential for oil spills onland and offshore should incorporate the possibility of effects on coastal fresh ground-water and surface-water resources. The following references may be of use: (1) Raisbeck, J.M. and Mohtadi, M.F., 1974, The environmental impacts of oil spills on land in the arctic regions: Water, Air, and Soil Pollution, vol. 3, p. 195-208; and (2) Duffy, J.J., Mohtadi, M.F., and Peake, E., 1977, Subsurface persistence of crude oil spilled on land and its transport in groundwater in Proceedings, 1977 Oil Spill Conference of API-EPA, p. 475-478.

for James F. Devine

Copy to: Director, MMS, Reston (MS-644)

Response 19-1

The effect of oil spills on onshore water quality was not raised as an issue in scoping for the proposed sale and, therefore, was not addressed in the DEIS. If an onshore pipeline were built, effects on onshore water quality could occur. At this point in time, an onshore pipeline is assumed, not planned. If an onshore pipeline were actually proposed for the Alaska Peninsula, water-quality effects would be treated in more detail in the environmental assessment of the proposed pipeline. The OCS-pipeline-spill rate converts to 0.25 spills per thousand kilometer-years (Lanfear and Amstutz, 1983), indicating that over the 19 years of oil production from the proposed sale, there would be only a 9-percent chance of 1 or more oil spills of 1,000 barrels or greater along the assumed 20 kilometers of onshore pipeline. Thus, it is very unlikely that a major onshore-pipeline spill would occur.

United States Department of the Interior
BUREAU OF MINES

ALASKA FIELD OPERATIONS CENTER
P.O. BOX 550
Juneau, AK 99802

20

March 4, 1985

Minerals Management Service
Regional Director
P.O. Box 101159
Anchorage, Alaska 99510

The U. S. Bureau of Mines Alaska Field Operations Center has reviewed the Draft Environmental Impact Statement for the Proposed 1985 Outer Continental Shelf Oil and Gas Lease Sale 92, North Aleutian Basin.

There are no known nonfuel mineral occurrences within the boundaries of the proposed sale area and the potential for such occurrences is low. Thank you for this opportunity to comment.

Donald P Blasko

Donald P. Blasko
Chief, AFOC

United States Department of Agriculture
Soil Conservation Service
Professional Center - Suite 129
2221 East Northern Lights Boulevard
Anchorage, AK 99508 (907) 276-4246

21

January 24, 1985

Thomas Boyd
U.S. Department of the Interior
Minerals Management Services
Alaska OCS
Box 101159
Anchorage, Alaska 99510

Dear Mr. Boyd:

We have reviewed the Draft Environmental Impact Statement for the North Aleutian Basin Sale. We have no comments to offer.

Thank you for the opportunity to review this document.

Sincerely,

Burton L Clifford

Burton L. Clifford
State Conservationist

(22)

Advisory Council On Historic Preservation

The Old Post Office Building
1100 Pennsylvania Avenue, NW, #809
Washington, DC 20004

Reply to: 730 Simms Street, Room 450
Golden, Colorado 80401

February 6, 1985

Thomas H. Boyd
EIS Coordinator
Environmental Assessment Section
Minerals Management Service
P.O. Box 101159
Anchorage, AK 99510

REF: Draft Environmental Impact Statement (DEIS) for North Aleutian Basin Sale 92

Dear Mr. Boyd:

We have received and reviewed the above-referenced DEIS. Consideration of submerged archeological resources appear to be thoughtful and thorough. But little information is provided concerning protection of cultural properties relative to development of on-shore facilities. We encourage Minerals
22-1 Management Service to begin investigations of potential effects on these properties at the earliest possible date. Council staff will be happy to assess in this effort. We look forward to working with you as planning for this project proceeds. If you have any questions, or if we can provide anything further at this time, please contact Dean Shinn at 776-2682, an FTS number.

Sincerely,

Robert Fink
Chief, Western Division
of Project Review

<u>Response 22-1</u>

The Alaska State Historical Preservation Office, the National Park Service, the Advisory Council, and other interested groups have contracted for consultation and investigation of the potential effects on onshore properties for a number of years. Detailed archeological surveys of onshore properties are not feasible until the oil-development phase begins (after resources are discovered) and more precise transportation alternatives are proposed by lessees. However, the MMS continues to collect data, to plan for future investigation, and to encourage the Advisory Council's assistance.

(23)

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON 20426

IN REPLY REFER TO:

OPPR/DPC/EEB
DEIS Comments
Aleutian Basin Sale

FEB 19 1985

Mr. Glen Yankus,
EIS Coordinator
Environmental Assessment Section
Mineral Management Service
P.O. Box 101159
Anchorage, Alaska 99510

Dear Sir:

We appreciate the opportunity to comment on the draft environmental impact statement (DEIS) evaluating the proposed North Aleutian Basin Sale No. 92. The Federal Energy Regulatory Commission (FERC) Office of Pipeline and Producer Regulation (OPPR) offers the following comments:

23-1 The section on Liquefied Natural Gas Imports on page I-17 of Appendix I, contains information that is outdated. As a result of the Department of Energy Act of 1977, the Federal Power Commission was superseded by the FERC. The authority to import and export natural gas would have to be obtained from the Economic Regulatory Administration of the Department of Energy. The authority to construct and operate facilities to implement imports and exports must be obtained separately from the FERC. In addition, the statements concerning a shortage of domestic natural gas and Algerian imports need to be updated.

Very truly yours,

Kenneth A. Williams, Director
Office of Pipeline and Producer Regulation

Response 23-1

Appendix I of the EIS has been amended to address this concern.

24

U.S. Department of Transportation
Office of the Secretary of Transportation

400 Seventh St., S.W.
Washington, D.C. 20590

January 18, 1985

Mr. William Bettenberg, Director
Minerals Management Service
U.S. Department of the Interior
Reston, VA 22091

Dear Mr. Bettenberg:

Your recent letter requests comments from this Department on the draft environmental impact statement for Proposed Offshore Oil and Gas Lease Sale No. 92, North Aleutian Basin.

Regional Representatives of the Secretary coordinate departmental comments on environmental impact statements (prepared by other agencies) that impact only one region and that may involve more than one DOT administration.

Accordingly, your letter has been referred to Robert Mayer, DOT Regional Representative of the Secretary, Regions IX, X, Room 1005, 211 Main Street, San Francisco, CA 94105. Thank you for the opportunity to comment.

Sincerely,

Eugene L. Lehr
Eugene L. Lehr, Chief
Environmental Division
Office of Transportation Regulatatory
Affairs

25

Walter J. Hickel

BOX 1780
ANCHORAGE, ALASKA 99510
907-276-7400

March 8, 1985

RECEIVED
MAR 1 1 1985
REGIONAL DIRECTOR, ALASKA OCS
Minerals Management Service
ANCHORAGE, ALASKA

Mr. Al Powers
Minerals Management Service
P.O. Box 101159
Anchorage, AK 99510

Dear Mr. Powers:

Opponents of leasing OCS lands in the North Aleutian Basin say we don't have enough data to support drilling. They may be right.

But as I understand the process, a sale doesn't automatically mean permission to drill, and permission to drill doesn't automatically begat permission to produce (if they find anything), and permission to produce doesn't automatically begat permission to transport... or automatically even mean a market. Suppose they find gas?

At each level the risks increase, and the rewards are better known. More data will be collected when we need more data. If nothing is found the risks will have been few.

I support carefully moving ahead with North Aleutian Sale 92 in December 1985, and careful consideration in the years ahead. But let's get started.

Sincerely,

Walter J. Hickel
Walter J. Hickel

(26)

STATE OF ALASKA

BILL SHEFFIELD, GOVERNOR

DEPARTMENT OF FISH AND GAME

P.O. BOX 37
KING SALMON, ALASKA 99613-0037

March 7, 1985

Glen Yankus
E.I.S. Coordinator
Environmental Assessment Section
Minerals Management Service
P.O. Box 101159
Anchorage, Alaska 99510

Dear Sir:

Enclosed are copies of news articles I have collected during the past four years that refer to oil spills, tanker accidents, drill rig accidents and related concerns. While I'm sure that no one wants to see such accidents occur, it is apparent that inspite of industry precautions they are happening. It is also apparent that containment and clean up operations associated with these events have been tough to accomplish with any degree of immediacy even inside bays and rivers. With this in mind I am especially concerned about the potential occurrence of such accidents in the Bristol Bay - Northern Aleutian shelf areas if oil leasing is allowed to occur there in 1985 as proposed in the Northern Aleutian Basin Sale 92.

Climatic conditions are often very severe in the Bristol Bay - Alaska Peninsula area. Low ceilings, fog, high winds, air column turbulence, icing, gale warnings, high seas, super tides, snow storms, and sea ice are all factors that may have to be overcome by anyone wishing to contain and retrieve an oil spill in this area.

These factors have often been obstacles to search and rescue personnel trying to reach stranded vessels, downed aircraft, lost hunters, etc. and save human lives. There will be even greater obstacles to the moving and deployment of specialized equipment.

I do not feel that the present technology and deployment techniques for containing oil spills under the adverse conditions often prevalent in the Bristol Bay - Northern Aleutian shelf areas inspire much confidence regarding their effectiveness in protecting fish, wildlife, or the habitat these require. I would hope that until such time as effective techniques can be developed to contain and clean up spills in rough seas the Bristol Bay - Northern Aleutian shelf areas will not be offered up for oil leasing. Thank you.

Sincerely,

Richard B. Russell

Richard B. Russell
Egegik-Ugashik Area Biologist

cc: Claudia Slater

(27)

Lake Minchumina
Alaska 99757
January 28, 1985

Thomas H. Boyd
EIS Coordinators
Minerals Management Service
P.O. Box 101159, Anchorage, Alaska 99510

Dear Sir,

Lacking any specific address for opinions on the North Aleutian Basin Sale 92 Draft Environmental Impact Statement, I am sending this to you.

Because of the present "glut" of oil on the world market, and oonsequent low price for petroleum products, it would be wise to cancel, or at least postpone, the leasing of this area. Both federal and state governments will lose a large amount of tax.revenue if production is sold at depressed prices. It is not worth the risk to the biological resources and the social stability of the region.

Both state and federal agencies have requested cancellation or deferral; though some of their most serious concerns have been addressed, their reasons were good, are still relevant, and their requests should be followed.

Sincerely,

Florence R. Collins

Florence R. Collins

MARINE MAMMAL COMMISSION
1825 EYE STREET, N.W.
WASHINGTON, DC 20006

(28)

13 March 1985

RECEIVED
MAR 18 1985
REGIONAL DIRECTOR, ALASKA OCS
Minerals Management Service
ANCHORAGE, ALASKA

Mr. Alan D. Powers
Regional Manager
Alaska OCS Region
Minerals Management Service
P.O. Box 101159
Anchorage, Alaska 99510

Dear Mr. Powers:

The Marine Mammal Commission, in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed the "Draft Environmental Impact Statement North Aleutian Basin Sale 92" and offers the following comments and recommendations.

GENERAL COMMENTS

The Draft Environmental Impact Statement (DEIS) provides an assessment of possible impacts from a proposed project to lease up to 990 blocks (approximately 5.6 million acres) of submerged OCS lands in the North Aleutian Basin of the southeastern Bering Sea off the Alaska Peninsula for the purpose of oil and gas exploration and development. It indicates that marine mammals likely to be found in the proposed sale area include sea otters, five species of pinnipeds, at least 10 non-endangered cetaceans and up to eight species of endangered whales. It also concludes that: impacts on pinnipeds and non-endangered cetaceans would be minor; the sea otter is the marine mammal at greatest risk from an oil spill and its regional population could sustain moderate impacts if a large spill occurred; effects on gray, fin, right, and humpback whales are likely to be minor; and impacts on bowhead, blue, sei, and sperm whales would be negligible.

28-1a The DEIS provides a reasonably thorough review and analysis of available information regarding the types of impacts, particularly from oil spills, noise and disturbance, that could affect marine mammals. It also provides an accurate and useful review of information on the status of most species of marine mammals likely to be affected. Most of the aforementioned conclusions concerning expected impacts on marine mammals seem justified, however, as discussed below, certain information and/or analyses not considered in the DEIS suggest that potential effects on northern fur seals, Steller sea lions, gray whales, and right whales have been underestimated. For example, the DEIS does not consider recent information concerning the size and ongoing decline of the northern fur seal population or the status of recent considerations for listing the species as threatened under

the Endangered Species Act. It also does not fully consider the likelihood or potential significance of disrupting or inhibiting gray whale feeding in the sale area or the implications of the ongoing Steller sea lion population decline for predictions of possible impacts on that species. Therefore, if it has not already been done, the Commission recommends that the Minerals Management Service consult with the National Marine Fisheries Service to ensure that: (a) information and impact assessments concerning the northern fur seal, the Steller sea lion, and the gray whale are complete and accurate; and (b) all measures necessary to detect and mitigate potential unforeseen effects on these species have been identified and addressed. The FEIS should be revised to reflect the results of these consultations.

The DEIS identifies a number of potential mitigating measures including stipulations for an orientation program and protection of biological resources and Information to Lessees on areas of special biological significance, bird and marine mammal protection, endangered whales, a Bering Sea Biological Task Force, and fairway designations. These measures would help reduce potential impacts associated with a lease sale and the Commission recommends that they be incorporated as part of the proposed action and other leasing alternatives as discussed below.

28-1b The DEIS also should be modified to: (a) provide additional discussion and analysis concerning possible cumulative effects on northern fur seals, gray whales, and other important living marine resources in the Bering Sea region; (b) identify the post sale research and monitoring responsibilities of the Service's Environmental Studies Program as a potential mitigating measure and describe its role in ensuring that lease managers have the types and quality of environmental information necessary for predicting, avoiding and detecting possible adverse impacts on endangered and non-endangered marine mammals and the ecosystem of which they are a part; (c) expand the oil spill trajectory analysis to consider additional hypothetical spill points and additional oil spill targets adjacent to the Alaskan Peninsula; (d) indicate that impacts on gray whales, northern fur seals, and Steller sea lions could be moderate to major and that impacts on right whales, while unlikely due to the species' rare occurrence in the sale area, could be major if they occur; and (e) indicate what was done to take account of the results of consultations with the National Marine Fisheries Service pursuant to Section 7 of the Endangered Species Act.

SPECIFIC COMMENTS

28-1c <u>Pages xviv to xx, Summary</u>: This section of the DEIS provides a summary of the proposed action, alternatives to the proposed action, and possible environmental effects. To provide a more complete assessment of the nature and possible effects of the proposed and alternative actions it should be expanded to describe possible cumulative effects of this and other existing or planned oil and gas related activities in the Bering Sea region. For example, it should be noted that offshore development associated with other lease sales already conducted or pending in the Bering Sea and elsewhere may cause significant adverse effects on certain populations of marine mammals and other important marine species (e.g., fur seals, gray whales, sea birds, and certain stocks of fish and shellfish) and that if such effects occur to those resources, additional adverse effects, as might result from activities associated with the proposed sale, could be much more significant than those projected in the DEIS, which are based on the current population status and size of regional living marine resources.

<u>Page xviv to xx:</u> The carry over paragraph on these pages refers
the reader to Table S-1, which provides an analysis of possible
effects of the proposed and alternative actions. The Table
28-2 indicates that effects on all pinnipeds would be minor. For the
reasons noted below, impacts on northern fur seals and Steller sea
lions could be moderate to major and the Table should be expanded
to include separate entries for these species. The Table should
also indicate that effects on gray whales could be moderate and
28-3 that effects on right whales could range from negligible to major.
In addition, for the reasons noted above, a new column entitled
something like "Cumulative Effects," should be added to the right
28-4 hand side of the Table to indicate the cumulative effects of this
and other activities in the region.

<u>Pages I-A-1 to I-B-1, Leasing Process:</u> This section describes
steps in the leasing process up through "Lease Operations." It
does not, but should, describe the role of the Minerals Management
28-5 Service's Alaska Environmental Studies Program which which is
responsible for ensuring that environmental information is
adequate to make informed decisions on leasing proposals as well
as lease operations once areas are leased.

<u>Page I-A-4, Endangered Species Consultation:</u> This section notes
that the Minerals Management Service initiated consultations with
the Fish and Wildlife Service and the National Marine Fisheries
Service pursuant to the requirements of Section 7 of the
Endangered Species Act and that the results of those consultations
are included in Appendix H of the DEIS. This section should be
expanded to note that a petition was submitted to the National
28-6 Marine Fisheries Service in January 1984 to list the northern fur
seal as threatened under the Endangered Species Act and that the
Service recently determined that this action is not warranted at
this time. As noted elsewhere in our comments, the Pribilof
Island population of fur seals is still declining in size and, if
it has not already been done, the Commission recommends that the

Minerals Management Service consult with the National Marine Fisheries Service to ensure that all necessary and appropriate mitigation measures for protecting this species are identified.

<u>Page I-B-1, third paragraph:</u> This paragraph notes that a decision
to propose the North Aleutian Basin for leasing was deferred by
the Secretary of the Interior in 1982. The reason for that
28-7 deferral and the reason for reversing the decision is not, but
probably should be, identified at this point in the FEIS.

<u>Pages II-C-2 to II-C-6, potential mitigation measures:</u> This
portion of the DEIS identifies a number of potential mitigating
measures designed to reduce potential impacts on various resources
including marine mammals. They include, stipulations for an
28-8 orientation program and protection of biological resources. Such
measures would help reduce or avoid potential impacts on marine
mammals and the ecosystems of which they are a part. Therefore,
the Commission recommends that they be incorporated as part of the
proposed action.

In addition, one of the most important steps that can be taken to ensure that environmental resources are not adversely affected is to ensure that the lease manager (the Regional Supervisor, Field Operations) has the environmental information necessary to make informed decisions with respect to lease operations. This need is identified in Section 20 of the Outer Continental Shelf Lands Act, which requires the Secretary of Interior to conduct environmental studies, including post-lease sale monitoring studies, as may be necessary to obtain information pertinent to sound leasing decisions and for the purpose of identifying any significant changes in environmental conditions. Specific research and monitoring needs are also identified in the Biological Opinion prepared by the National Marine Fisheries Service for this sale and included in Appendix H.

The Minerals Management Service's Regional Environmental
Studies Program, which addresses these requirements and needs, has
provided, and should continue to provide, information essential
for predicting, detecting and mitigating potential environmental
impacts. Management related research, however, is not identified
as a potential mitigating measure here or elsewhere in the DEIS.
The Commission, therefore, recommends that this section of the
28-9 DEIS be expanded to identify and describe, as a potential
mitigating measure, the post-leasing research and monitoring
responsibilities of the Service's Regional Environmental Studies
Program. Among other things, the new section should identify the
Program's role in ensuring that lease managers are able to detect
and mitigate possible unforeseen effects.

<u>Page II-C-3, Orientation Program:</u> The third sentence of this
section notes that an orientation program could be required that,
28-10

in part, would "...ensure that personnel understand the importance of avoidance and nonharassment of wildlife resource." The orientation program should cover the legal authorities and penalties relating to this matter and, since it is not clear whether the described orientation program would address this point, we suggest that something like the words "...and legal authorities and penalties pertinent to..." be inserted between the words "...importance of..." and "...avoidance..." in the third sentence of the section. As noted above, the Commission recommends that this potential mitigating measure be incorporated as part of the proposed action and other leasing alternatives.

28-11 <u>Page II-C-4, Protection of Biological Resources:</u> The first sentence of this section notes that the Regional Supervisor, Field Operations may require the lessee to conduct certain biological surveys. To reflect the role of the Bering Sea Biological Task Force, as discussed in the pertinent Information to Lessees notice on page II-C-8 of the DEIS, something like the words "...,in consultation with the Bering Sea Biological Task Force,..." should be inserted between the words "...the RSFO..." and "...may require..." in the first sentence of the section. A similar insert would also seem appropriate at the corresponding location in the first line of the second paragraph of the section. The Commission recommends that this proposed mitigation measure be incorporated as part of the proposed action and other leasing alternatives.

28-12 <u>Pages II-C-6 to II-C-12, Information to Lessees:</u> This section describes mitigating measures considered as "Information to Lessees," which would provide lease operators with information on: areas of special biological sensitivity; a Bering Sea Biological Task Force, bird and marine mammal protection; endangered whales; fairway designations; and certain other topics. These measures would help ensure that lessees are aware of information and measures that would help reduce or avoid possible adverse impacts and the Commission recommends that they be included as part of the proposed action. Also, since new information is likely to become available over the course of possible lease development, the introduction to this section should be expanded to indicate that these notices would be updated from time to time as needed.

28-13 <u>Pages II-C-7 to II-C-8, Information on Areas of Special Biological Sensitivity:</u> Unimak Pass should be added to the list of areas that are especially important to marine mammals and birds.

28-14 <u>Page II-C-8, Information on Bering Sea Biological Task Force:</u> The third sentence of this section notes that the "...RSFO will consult with the Bering Sea BTF on the conduct of biological surveys by lessees, the appropriate course of action after surveys have been conducted, and the biological aspects of the

lessee's proposed activities." Since the Biological Task Force also would provide a useful source of advice with respect to studies supported through the Service's Regional Environmental Studies Program, something like the words "...and through the Alaska Environmental Studies Program..." should be inserted between the words "...surveys by lessees..." and "...the appropriate..." in the third sentence of the section.

28-15 The section also indicates that membership on the BTF would include representatives of the Minerals Management Service, the National Marine Fisheries Service, the Fish and Wildlife Service, and the Environmental Protection Agency and that representatives of the State of Alaska would be encouraged to attend Task Force meetings. The State of Alaska has important authorities for managing resources in the area and has jurisdiction over areas that are likely to serve as staging areas and transportation corridors for offshore development. Therefore, if you have not already done so, we suggest that the State be invited to participate as a full member of the Bering Sea Biological Task Force.

28-16 <u>Pages II-C-14, first complete paragraph:</u> This paragraph provides conclusions with respect to the effectiveness of potential mitigating measures on pinnipeds and sea otters. The first sentence of the paragraph concludes that "...mitigating measures potentially reduce noise and disturbance effects on marine mammals from minor to negligible." Since the section discusses only pinnipeds and sea otters, the term "marine mammals" presumedly should be changed to "pinnipeds and sea otters". The second and third sentences of the paragraph conclude that "(p)otential oil-spill effects may be reduced somewhat by the above mitigating measures...(h)owever, moderate effects on sea otters are still likely." For reasons noted below, effects on northern fur seals and possibly Steller sea lions also may be greater and the paragraph should be expanded to identify the greater risks for these species as well as sea otters.

28-17 <u>Page II-C-14, Endangered and Threatened Species:</u> This section discusses the effectiveness of "Information to Lessees" on bird and marine mammal protection, endangered whales, and areas of special biological significance. As indicated above, the effectiveness of these notices would be improved with better information on the biology and ecology of the marine mammals and birds concerned. Thus, the role and responsibility of both the lessees and the Service's Regional Environmental Studies Program in monitoring and improving available information on the demography, biology and ecology of such species should be identified and discussed in this section.

28-18 <u>Unnumbered pages following page II-D-1, Table II-2:</u> This Table provides a summary and comparative analysis of the potential major effects of the proposed and alternative actions. For reasons noted below, the section of the Table entitled "Pinnipeds and Sea Otters" should be revised to indicate that effects on northern fur seals and possibly Steller sea lions could be moderate to major. Also for reasons noted below, the section of the Table entitled "Endangered and Threatened Species" should be revised to indicate that effects on gray whales could be moderate and effects on right whales could range from negligible to major.

28-19 Pages III-B-27 to III-B-28, Northern Fur Seal: This section provides information on northern fur seals and notes that the Pribilof Island population is estimated to number 1.25 million animals. It does not discuss current population trends reported in recent publications and should be revised to indicate that: the Pribilof Island population of fur seals has been declining at an average rate of 5% to 8% per year in recent years; the most recent Pribilof Island population estimate is 871,000 seals (North Pacific Fur Seal Commission, 1984); and the population currently is at or below 50% of its levels in the late 1940's and early 1950's and is still declining (Department of Commerce, 1984). If it has not already been done, the Commission recommends that the Minerals Management Service consult with the National Marine Fisheries Service to ensure that the DEIS reflects the best available information concerning the population status and trends.

28-20 Page III-B-28, first complete paragraph: This paragraph introduces a section on species listed as endangered or threatened under the Endangered Species Act. It should be expanded to discuss recent deliberations by the National Marine Fisheries Service on a petition to list the northern fur seal as threatened.

28-21 Page III-B-28, Bowhead Whale: A reference should be provided for the statement that the most recent bowhead whale population estimate is 4,000 individuals.

28-22 Pages III-B-28 to III-B-29, Right Whale: This section notes, among other things, that the right whale was over exploited by whalers in the 19th century and probably now numbers only a few hundred animals. To our knowledge, no more than two right whales have been sighted together in the North Pacific at any one time since the mid 1960's and no more than one or two sightings per year have been reported in the last 20 years. Therefore, an estimate of even "a few hundred animals" seems unsupported and high. It would seem more accurate to indicate that perhaps only a few tens of right whales still survive in the North Pacific and, if it has not already been done, the Commission suggests that the Minerals Management Service consult with the National Marine Fisheries Service to assure that the FEIS reflects the best available information on the abundance of this species.

28-23 Pages IV-A-10, Oil-Spill Trajectory Simulations: This section refers the reader to Graphic 5, which identifies the location of potential oil spill launch point from hypothetical platforms, pipeline routes, and tanker corridors in the North Aleutian Basin. The labeling of these points on Graphic 5 is confusing. For example, it is not clear what type of spill source point E 24 in Unimak Pass is intended to represent. In addition, information concerning the movement of possible spills from this point is not presented with the results of the oil spill trajectory analyses in Appendix G. Therefore, Graphic 5 should be revised to indicate which points represent what type of spill source (e.g. platform, pipeline, tanker, etc.) and the appropriate tables in Appendix G should be expanded to indicate targets likely to be affected by a spill occurring in Unimak Pass.

28-24 Pages IV-A-11 to IV-A-12, Weathering and Cleanup: This section notes that oil spill trajectory simulations are presented as probabilities of a spill intersecting certain identified land segments, sea targets, or biological resource areas. Sea targets and Biological Resource Areas are shown in Figures G-1 and G-2 in Appendix 2. As noted elsewhere in the DEIS, nearshore areas along the northern shoreline of the Alaskan Peninsula are important feeding and migratory habitat for gray whales as well as other marine species such as sea otters and sea birds. These important habitats, however, are not well represented in the model as possible oil spill targets. Thus, results of the oil spill trajectory simulations are not as useful as they could or should be for assessing risks to those areas. Therefore, additional Biological Resource Areas should be identified and shown on Figure G-2, which represent the important nearshore feeding and migratory habitats for gray whales and other marine species. Waters closer than about 25 miles of shore between Biological Resource Areas 14 and 6, 6 and 7, and 7 and 8 as shown on Figure G-2 should be so identified.

28-25 Also, since the analysis of the proposed action assumes that oil will be shipped to refineries from Balboa Bay on the south side of the Alaskan Peninsula, it would be desirable to include additional hypothetical oil spill launch points and targets along the likely tanker corridor in and out of that location.

28-26 Pages IV-B-46 to IV-B-55, Effects on Pinnipeds and Sea Otters: This section provides a useful discussion of possible effects on pinnipeds and sea otters. However, it does not reflect differences in the status and trends of various populations. Specifically, both the northern fur seal and Steller sea lion populations have been declining for several years and, thus, even relatively small effects could further depress recruitment rates or increase mortality rates accelerating the ongoing population declines or delaying recovery. It is conceivable that more than a generation could be required to recover from such effects and, therefore, statements in the "Summary" and "Conclusion," which indicate that the effects on all pinnipeds would be minor, should be revised to indicate that effects on northern fur seals and Steller sea lions could range from minor to major.

28-27 Page IV-B-47, Oil Spill Avoidance: This paragraph cites available information suggesting that pinnipeds and sea otters are not likely to avoid oil spills in all situations and that "...if an oil spill contacted high-density sea otter habitat areas...or occurred near seal and sea lion rookeries and major haulout areas, a few to several thousand individuals could be contaminated." Virtually the entire Pribilof Island population of northern fur seals, including nursing females, feed in and migrate through waters to the west of the proposed sale area. If a large spill were to occur and drift through this corridor over a period of several days or weeks during fur seal's summer breeding season or the spring and fall migratory periods, the combined movements of the spill and fur seals could result in up to several tens of thousands of individuals becoming contaminated and perhaps being killed. Therefore, something like the words "foraging areas, migratory corridors," should be inserted between the words "seal and sea lion" and "rookeries" in the fourth sentence of the paragraph.

28-28 Page IV-B-47, third complete paragraph: The reference to Figure IV-2 in the last line of the paragraph should be changed to Figure IV-4. In addition, the use of the term "marine mammal" in the subsequent paragraphs of this section should be changed to something like "pinnipeds and sea otters" since this section addresses only pinnipeds and sea otters.

28-29 Page IV-B-48, first complete paragraph: The fifth and sixth sentence of this paragraph note that a 2,000 barrel oil spill could spread discontinuously over a 100 square kilometer area killing "a maximum of 400 to 700 otters" assuming a density of 4 to 7 otters per square kilometer. As noted on page III-B-24, pods of up to 1000 otters have been reported near Amak Island and, if a spill were to come into contact with an area more densely populated than the overall average density for the region (about 4 to 7 otters per square kilometer), losses could be considerably greater than the "maximum" number cited in this paragraph. Therefore, a new sentence should be added following the sixth sentence of the paragraph reading something like the following:

> "Losses, however, could exceed 1000 animals if a spill was to come into contact with one or more pods of otters whose densities were greater than the overall average density for the area."

Subsequent discussion in the paragraph should be changed to reflect the possibility of loosing more than 4% of the regional sea otter population. This change should be made elsewhere in the DEIS where similar statements are made.

28-30 Pages IV-B-52, third complete paragraph: The first sentence of this paragraph notes that: several thousand sea lions and other pinnipeds could be exposed to oil spills; fewer animals (probably in the hundreds of animals) are likely to come in direct contact with a spill; and only weakened or highly stressed individuals are likely to be seriously injured or to die as a result of the spill. The paragraph should be expanded to note that the declining northern fur seal and Steller sea lion populations may indicate that individuals of these species are already highly stressed and that a greater percentage of these populations possibly could be killed or injured by a spill.

28-31 Pages IV-B-53 to IV-B-54: The carry over paragraph on these pages notes, with respect to possible cumulative effects on northern fur seals, that several thousand seal pups and females could be killed if a rookery on the Pribilof Islands was contaminated by a large spill and that oil spills in offshore habitat could kill a few hundred seals causing minor to negligible effects on the overall population. Given concentrations of several hundred thousand seals on the Pribilof Islands during the pupping and breeding season, the direct and indirect effects of a large spill which contacts one or more major rookeries during the pupping season could result in the loss of several tens of thousands of seals. As noted above, it is conceivable that similar losses could occur in association with a large spill if it was to affect important at-sea foraging habitat. Therefore, this paragraph should be modified to reflect a potentially greater loss of northern fur seals if a large oil spill contacts important fur seal habitats. In addition, the paragraph should be expanded to note that cumulative impacts associated with recent and pending lease sales in the Bering Sea and elsewhere excluding proposed sale 92 could result in moderate to major impacts on northern fur seals and that potential effects resulting from the proposed sale therefore could affect a declining population that already has sustained major impacts from oil spills associated with other lease sales.

28-32 Page IV-B-54, first complete paragraph: This paragraph notes that Steller sea lions, harbor seals and walrus "...are considered far less sensitive to oil spill contact than sea otters and fur seals...and are unlikely to suffer any appreciable mortalities as a result." For reasons noted above, this may not be true for the Steller sea lion and the discussion should be revised accordingly.

28-33 Page IV-B-63, first complete paragraph: This paragraph states that "(i)n summary, geophysical seismic activities associated with the lease sale are not expected to adversely affect endangered whales(,)...to preclude a successful migration or to disrupt feeding or mating activities." Although the preceding discussion in the DEIS provides information suggesting that noise and disturbance, including seismic surveys, are not likely to preclude successful gray whale migrations, it does not provide sufficient information to conclude that such noise and disturbance would not be likely to inhibit feeding. That is, the information presented primarily reflects experience from gray whale breeding grounds off Mexico and migratory corridors off California --information from the northern end of the species range is sparse.

28-34 A large percentage of the gray whale population migrates through, and possibly feeds in, the North Aleutian Basin area. The presence, location and importance of gray whale feeding grounds in the lease sale area not known. It is also not known precisely how seismic survey-related noises and other sources of noise and disturbance might affect feeding, either directly or by affecting prey behavior. Therefore, this paragraph should be changed to indicate that effects from geophysical seismic activities are uncertain, but could be substantial if they preclude feeding and the lease sale area represents an important segment of the population's preferred feeding grounds.

28-35 <u>Page IV-B-64, second paragraph:</u> This paragraph discusses studies indicating that oil fouled baleen initially becomes matted but, after several minutes to several hours of flushing, returns to an unmatted condition. It concludes that "filtering efficiencies might be jeopardized for less than 24 hours after a feeding foray in oil." The referenced studies test for effects of fresh oil and, since gray whales are benthic feeders, it would seem likely that any oil contacted by this species during feeding would be of a well weathered mousse or tar consistency whose effects on baleen may differ from those described. Therefore, this paragraph should be expanded to note that findings from the referenced studies may not be applicable to predictions of effects on gray whales that may come into contact with oil during feeding forays. It also should be noted that the presence of floating or submerged oil could inhibit gray whale feeding activity or cause abandonment of preferred feeding grounds.

28-36 <u>Pages IV-B-65 to IV-B-66:</u> These pages discuss the results of the oil spill trajectory analysis as they apply to gray whale habitat. As noted above, at-sea targets and biological resource areas considered as possible oil spill targets do not appear to adequately represent all areas important as gray whale feeding and migratory habitat in the nearshore waters off the north coast of the Alaskan Peninsula. In addition, since water currents tend to flow parallel to the shore in that area (see for example DEIS Figure III-3), it would seem possible that oil spills simulated in the trajectory analysis could contact and travel through these important nearshore areas without actually intersecting adjacent

land boundary segments. Thus, possible oil spill risks to these areas may not be reflected completely in the oil spill trajectory analysis. To avoid underestimating the risk of a spill contacting these nearshore habitats, additional biological resource areas, as discussed above, should be factored into the oil spill trajectory analysis and the results of that reassessment should be discussed in this section of the FEIS.

28-37 <u>Page IV-B-66, third and fourth complete paragraphs:</u> As noted above, available information concerning the possible importance of the lease sale area as a gray whale feeding ground and the effects of oil, noise and disturbance on gray whale prey and feeding activity, is not sufficient to conclude that effects on this species are likely to be minor. Therefore, we suggest that these paragraphs be revised to indicate that potential effects on this species are uncertain, but could be substantial if feeding activity is precluded and the lease sale area represents an important segment of the population's available feeding ground.

28-38 <u>Pages IV-B-66 to IV-B-68, Cumulative Effects (Effects on Gray Whales:</u> This section discusses the cumulative effects of ongoing and planned development in the Bearing Sea region on gray whales and concludes that the cumulative effects of oil spills and noise disturbance on gray whales would be moderate. It does not consider possible effects of ongoing and planned development in the species' breeding grounds in Mexico or along the full extent of its migratory corridor. If development and activities in these areas are considered, substantially greater impacts might be predicted. Therefore, the section should be expanded to identify the cumulative risk to the population throughout its range.

28-39 <u>Page IV-B-71, first complete paragraph:</u> This paragraph notes that due to the paucity of right whale sightings in the lease area, interactions between right whales and seismic activities are not anticipated, however, if an interaction were to occur, "effects to the local population may result in moderate effects to the regional population depending on what proportion the local population is of the regional population." As noted above, the North Pacific right whale population may number only a few tens of animals. While the paucity of sightings in the area would seem to support a conclusion that impacts on this species are unlikely, it also seems that any adverse impact that does occur would affect a significant proportion of the population. Therefore, the assessment of the possible effects on the North Pacific right whale population, here and elsewhere in the DEIS, should be changed to indicate that adverse impacts are not expected to occur, but if they do, they could range from minor to major levels.

28-40 <u>Page IV-B-83, Unimak Pass:</u> This paragraph discusses oil spill risks to non-endangered cetaceans in Unimak Pass. It notes, among other things, that: the highest probability of an oil spill contacting Unimak Pass is 15% from spill point P 20; since many non-endangered cetaceans are present from March through December and spill probabilities are based on a year-round risk, the actual probability of spill-cetacean interaction would be lower than 15%; and the overall probability of an oil spill affecting Unimak Pass is unlikely. It does not seem possible that spill point P 20, located perhaps 30 or more miles north of Unimak Pass would have a greater probability of contacting the Pass than a spill originating at spill point E 24, which appears to be located in the Pass. In addition, it should be noted that the risk of a tanker spill in Unimak pass probably would be greater than other areas along their routes because navigation hazards associated with narrow channels, shifting currents, and shallow waters would be greater. Thus, the probability of spill-cetacean interaction probably would be greater than 15%.

<u>Appendix H, Biological Opinion on Endangered Species:</u> This section of the the DEIS includes letters received from the National Marine Fisheries Service and the Fish and Wildlife Service providing Biological Opinions as required by the Endangered Species Act. Among other things, the Biological Opinion prepared by the National Marine Fisheries Service notes that "(t)o avoid the likelihood of jeopardy to the gray whale, we
28-4 believe that the identified alternatives given by MMS of leasing deferrals within a 50-mile radius of Unimak Pass and the Pribilof Islands, and within 25 miles of shore along the Alaska Peninsula, will substantially reduce the risk of oilspills to gray whales and should be adopted". The Opinion also recommends certain research and monitoring studies that should be undertaken to ensure that potential unforeseen effects are detected and can be mitigated. These determinations seem well justified and, if they are not adopted, the reasons for not adopting them should be explained in detail in the FEIS.

I hope these comments and recommendations are helpful. If you or your staff have any questions, please contact either David W. Laist or me.

Sincerely,

David W. Laist for

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

Enclosure

cc James L. Baker
William D. Bettenberg
William H. Lang
Richard B. Roe

ENCLOSURE

REFERENCES

North Pacific Fur Seal Commission. 1984. Proceedings of the 27th Annual meeting, April 9-13, 1984, Moscow, U.S.S.R. Issued from the Headquarters of the North Pacific Fur Seal Commission. Washington D.C. 50p.

Department of Commerce. 1984. Report of the United States Delegation Twenty-Seventh Meeting of the North Pacific Fur Seal Commission, Moscow, U.S.S.R., April 9-13, 1984. Prepared by the Office of International Fisheries. National Marine Fisheries Service. 6p + Appendices.

Response 28-1a

This EIS takes into account the recent decline of the northern (Steller) sea lion population, while the Sale 89 FEIS takes into account the decline of the northern fur seal population, which is more relevant to the St. George Basin lease sales. An analysis of the effects of the lease sale on northern sea lions and northern fur seals is contained in Section IV.B.1.a.(3) (also see Responses 26-11, 28-13, and 28-27).

Response 28-1b

The cumulative effects sections on pinnipeds and sea otters (Sec. IV.B.1.a.(3) of the FEIS) and endangered and threatened species (Sec. IV.B.1.a.(4)), analyze the cumulative effects on fur seals and gray whales, respectively.

A discussion concerning the MMS Environmental Studies Program is contained in Appendix K. The EIS also has been amended to include a list of studies specific to the North Aleutian Basin area that are proposed for 1986 and 1987.

Because of the configuration of the North Aleutian Basin lease sale area, spill points adjacent to the Alaska Peninsula are not deemed necessary because the sale area is 18 kilometers from the coastline. Oil spills could not occur any closer than 18 kilometers from the coast.

Response 28-1c

Table S-1 (of the FEIS) has been expanded to include cumulative effects.

Response 28-2

Table S-1 has been amended to reflect concerns about possible greater effects on northern fur seals.

Response 28-3

Table S-1 briefly summarizes the conclusions stated in Section IV. A cumulative-effects component has been added to Table S-1 of the FEIS.

Response 28-4

Table S-1 has been expanded to include cumulative effects.

Response 28-5

Appendix K describes the role of the Alaska OCS Regional Studies Program and includes a list of environmental and social and economic studies pertaining to the North Aleutian Basin area.

Response 28-6

Appendix H on endangered species consultation need not be expanded to include northern fur seals because the NMFS decided not to place the northern fur seal on the endangered or threatened list (Federal Register 50[44], March 6, 1985).

Response 28-7

Section I.B. (Leasing History) has been amended in response to your comment, and the litigation history for the North Aleutian Basin has been added to the text (Section I.C. of the FEIS).

Response 28-8

Standard mitigating measures that are in place include those mandated by the OCS Lands Act (Sec. II.C.1.a.). In accordance with Council on Environmental Quality guidelines (1502.14), the EIS includes appropriate mitigation measures (Stipulations and Information to Lessees); however, although the measures are evaluated in Section II.C.1.d. (Effectiveness of Potential Mitigating Measures), the EIS analysis does not assume that these measures are in place. Subsequent to publication of the FEIS, the Secretary will consider the measures that may be adopted for Sale 92. Those measures that are adopted will appear in the Notice of Sale.

Response 28-9

The MMS feels that a mitigating measure describing postlease research and monitoring responsibilities of the MMS Regional Environmental Studies Program is not warranted. Section 20(a)(b) of the OCS Lands Act grants the Secretary of the Interior postlease research and monitoring responsibilities:

> (b) Subsequent to the leasing and developing of any area or region, the Secretary shall conduct such additional studies to establish environmental information as he deems necessary and shall monitor the human, marine, and coastal environments of such area or region in a manner designed to provide time-series and data-trend information which can be used for comparison with any previously collected data for the purpose of identifying any significant changes in the quality and productivity of such environments, for establishing trends in the areas studied and monitored, and for designing experiments

> to identify the causes of such modified form as the Secretary considers appropriate, and stating his reasons therefore. All such correspondence between the Secretary and the Governor of any affected State, together with any additional information and data relating thereto, shall accompany such proposed program when it is submitted to the Congress.

Because the Secretary is provided this authority under the OCS Lands Act, this requested mitigating measure is a legal requirement currently in place and considered part of the proposal (see Sec. II.C.1.a. of this FEIS).

Response 28-10

The Orientation Program (Stipulation No. 2) has been modified to include a presentation of legal authorities and penalties pertinent to the harassment of wildlife resources.

Response 28-11

This concern is addressed in Response 1-24.

Response 28-12

This concern is addressed in Response 28-8.

Response 28-13

The Information to Lessees on Areas of Special Biological Sensitivity has been amended to include Unimak Pass (Sec. II.C.b.(2) of the FEIS).

Response 28-14

The Bering Sea BTF includes an MMS representative from the Office of Leasing and Environment, which includes the Environmental Studies Unit. This representative works with the Environmental Studies Program and makes extensive use of the studies results of this program by providing recommendations to the RSFO concerning biological matters brought before the BTF. Because the requested revision is an inherent part of the composition and practice of the BTF, it is not necessary to revise the ITL.

Response 28-15

The Biological Task Force (BTF) is funded by the Department of the Interior and is composed wholly of federal-government agencies, thus, the BTF is not chartered under the Federal Advisory Committee Act (5 U.S.C., Appendix 1) and state, industry, and local representatives participating in the BTF cannot be afforded voting

status. Nevertheless, the BTF consults with representatives who may participate on the BTF in an advisory capacity. This arrangement has proven to be workable and effective. In the past, the state has effectively consulted with the BTF on the application of the Biological Resources stipulation on a site-specific basis; and this consultation is expected to continue in the future.

Response 28-16

The text (Sec. II.C.2. of the FEIS) has been amended to reflect these concerns. Also, the concern about greater effects on northern fur seals is addressed in Response 28-27. The concern about possibly greater effects on Steller sea lions is addressed in Response 6-11.

Response 28-17

The purpose of Section II.C.1.c. (Effectiveness of Potential Mitigating Measures) is to describe how the effects discussed for the proposal would be mitigated if the measures were adopted. Appendix K provides a discussion of the research topics and objectives of the Alaska OCS Region's Environmental Asscessment Program.

Response 28-18

Tables S-1 and II-2 and the text (Sec. IV.B.1.a.(3) of the FEIS) have been amended to reflect these concerns about moderate effects on fur seals. The concern that effects on fur seals would be major is addressed in Response 28-27.

Response 28-19

The text has been amended to reflect the concerns about the most recent population estimate for the northern fur seal (Sec. III.B.3.). The concern about the MMS/NMFS consultation on the northern fur seal is addressed in Response 28-6.

Response 28-20

If the fur seal were subsequently listed, a section would be added to the endangered and threatened species descriptions. Since the NMFS determined not to list the fur seal, a duplicative description of a nonendangered or threatened species in this section is not necessary.

Response 28-21

A reference has been provided for the statement that the most recent bowhead whale population estimate is 4,000 individuals.

Response 28-22

The estimate of the North Pacific right whale population of 100 to 200 individuals is taken from two NMFS biological opinions (Sale 70 and 89) and two NOAA technical reports (Leatherwood et al., 1982; Morris et al., 1983).

Response 28-23

Graphic 5 has been revised. Hypothetical Launch Point E24 is within Unimak Pass, on the tanker route south of the Bering Sea. Conditional probabilities for this launch point have been added to Appendix G.

Response 28-24

Because gray whale habitat is generalized and not site-specific in the North Aleutian Basin, additional targets would provide only minimally useful information. As an alternative approach, the EIS assumes that a spill contacts the whale habitat and analyzes what this would mean to the whales. (If both an animal species and a spill occurred almost anywhere in the study area, the probability of spill contact with the habitat of that species would become equal to that of a spill occurring). Thus, the approach used in this EIS is conservative--it assumes that habitat contact occurs. A more complete selection of targets might demonstrate that this assumption is overly pessimistic, and that habitat contact would not necessarily occur.

Response 28-25

This concern is addressed in Response 4-14.

Response 28-26

This concern is addressed in Response 6-11.

Response 28-27

The number of northern fur seals likely to be contacted by an oil spill moving west from the lease sale area into the foraging area and migration path of this species is likely to include no more than a few hundred to perhaps a thousand seals because of the rapid evaporation and dispersion of the oil before it reaches the fur seal habitat, and because fur seals do not occur in large aggregates or herds while foraging at sea or migrating to and from wintering grounds.

Response 28-28

The text has been amended to reflect these concerns (see Sec. IV.B.1.a.(3) of the FEIS).

Response 28-29

This concern is addressed in Response 6-13.

Response 28-30

This concern is addressed in Response 6-11.

Response 28-31

The concern about greater effects on northern fur seals and other pinnipeds from a spill on their foraging grounds is addressed in Response 28-23. The text in Section IV.B.1.c. is amended to reflect the later response. The commentor's suggestion that MMS should assume that fur seals have sustained "major impact" from oil spills associated with other lease sales (St. George Basin, Navarin Basin, etc.) is not valid because no commercial quantities of oil have been discovered and no OCS-related spills have occurred affecting fur seals. However, major effects on northern fur seals or sea otters are possible in a severe (but unlikely) situation. Refer to the conclusion in Section IV.B.1.a.(3).

Response 28-32

This concern is addressed in Response 6-11.

Response 28-33

The data on which the analysis is based are adequate, since the majority of the whales migrate through or adjacent to the lease sale area. Richardson et al. (1984) indicate that bowheads exposed to seismic noise less than 160 dB and farther than 6 kilometers away did not appear to be adversely affected by seismic activity. Malme et al. (1984) concluded that during a short, moving-airgun experiment, gray whales showed no behavioral responses--even at 1.5 nautical miles. Ljungblad et al. (1982) reported that gray and fin whales (some with calves) had no apparent responses to an active geophysical boat 40 to 45 kilometers away while summering in the Chukchi Sea.

Response 28-34

There are no known gray whale-feeding areas in the lease sale area. The known gray whale-feeding areas in the Bristol Bay area are the lagoons and estuaries that occur in state-managed waters. At its closest proximity to shore, the lease area is 18 kilometers offshore; on their northbound migration, gray whales generally stay within 0.1 to 1.0 kilometers offshore. This would put them in a range of at least 17 kilometers from a seismic source. Richardson et al. (1984) indicate that there was no apparent disturbance in bowhead whales during the summer feeding period if seismic surveys were farther than 6 kilometers from the whales and the sound levels were less than 160 dB. This behavior also is supported by Malme et al. (1984), who found that gray whales off California had led an effective estimated range of 2.5 kilometers from the source levels (seismic array), producing a 50-percent probability of avoidance. Therefore, feeding in the nearshore areas would not be precluded by seismic activities in the lease area (see NMFS biological opinion, Appendix H).

Response 28-35

Gray whales are omnivores that feed on both benthic and pelagic fauna; however, the predominant prey items found in gray whale stomachs are benthic amphipods, and gray whales seem to congregate to feed in areas with high densities of benthic amphipods. Sand and gravel (up to several liters) also have been found in whale stomachs. Nerini and Oliver (1983) described the gray whale feeding behavior as "sucking up benthic infauna." The whales leave shallow, elliptical depressions in their feeding wakes. Gray whales appear to select areas of high amphipod biomass.

Oil can reach bottom sediments by various mechanisms--one is by direct mixing of oil with sediments by wave action in shallow water and subsequent transport to deep water by density currents. Sorption onto particulate matter suspended in the water column, with subsequent sinking, can also occur in deeper water. Another mechanism for sedimentation of oil is uptake by zooplankton, packaging as fecal pellets, and the subsequent sinking of the pellets. Heavier-molecular-weight hydrocarbons will typically reach ocean sediments in proportion to the supply in surface waters.

Once in the sediments, hydrocarbons are taken up by benthic organisms with greater uptake of the heavier- (relative to the lighter-) molecular-weight aromatic compounds. Howarth (personal communication, 1984) stated that available evidence suggests that the dilution of oil-contaminated sediments following a spill in an offshore area (i.e., Georges Bank) is sufficient to keep oil concentrations low enough to cause little harm. Therefore, oil transported and incorporated into the sediment by sorption or fecal-pellet transport probably would not reform into the thickened, weathered oil that gray whales may incidentally ingest.

Transport of heavy, weathered oil from the intertidal-wave zone into deeper water probably would not persist in a localized area for long periods of time (over 2 years). Observations of oil in the sediments 6.5 years after the Metula spill indicated that the entire area below the low-tide line was free of oil. The oil that persisted in the sediments was above this area (Gundlach et al., 1982). Therefore, the data do not support the theory that gray whales are likely to ingest heavy, weathered oil that has settled

to the bottom. It is not anticipated that gray whales would ingest heavy, weathered oil; but they may ingest oil-contaminated amphipods and thereby indirectly ingest oil in some form.

Response 28-36

This concern is addressed in Responses 6-111a and 28-24.

Response 28-37

There is no information from the literature or from researchers to indicate that the lease sale area has any gray whale feeding areas within its boundaries. All known feeding areas are shoreward of the lease boundaries.

Response 28-38

Nowhere in the cumulative analysis on gray whales does it state that only activities in the Bering Sea are addressed. The first paragraph has been revised to clarify the activities considered in the cumulative analysis (Sec. IV.B.1.a.(4) of the FEIS). Actions in the Mexican calving lagoons are not considered due to the uncertainty of future activities that may occur there; otherwise, this section does consider the increased risk to the population from the proposal, including cumulative activities throughout its range.

Response 28-39

Ranges of effects are not given in Section IV to prevent confusion of the general public and therefore only one conclusion is developed which best fits the definitions for the particular group of interest.

Response 28-40

Although Spill Point E24 probably would result in higher contact probabilities, it was not analyzed for this EIS. The risks associated with a tanker spill in Unimak Pass are presented in the Sale 89 (St. George Basin) FEIS (see also the worst-case analysis in the Sale 89 FEIS, which is incorporated herein by reference).

Response 28-41

An EIS is not a decision document. The Secretarial Issue Document presents information to the Secretary of the Interior which will be used in his decisionmaking process. All options and suggestions (received during the EIS process) regarding the area to be leased are contained in the EIS. A final determination regarding the sale configuration is not made by the Secretary until publication of the Notice of Sale. Since the Secretary's decision regarding the sale configuration is made after the FEIS is published, the reasons for selecting a particular area are not available for publication in the FEIS.

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29

Msars. Glen Yankus/Thomas Boyd
EIS Coordinators
Minerals Management Service
P.O. Box 101159
Anchorage, AK 99510

March 14, 1985

Dear Msars. Yankus and Boyd:

The Natural Resources Defense Council and Trustees for Alaska appreciate the opportunity to comment on the Draft Environmental Impact Statement for OCS Lease Sale 92 in Bristol Bay. If you have any questions regarding these comments, please do not hesitate to contact me.

Sincerely yours,

Lisa Speer
Coastal Resource Specialist

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Comments of

Natural Resources Defense Council

and

Trustees for Alaska

on the

Draft Environmental Impact Statement

for

OCS Lease Sale 92

Bristol Bay

Prepared by
Lisa Speer
NRDC
March 14, 1985

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The Natural Resources Defense Council and Trustees for Alaska (hereafter NRDC) submit the following comments on the Draft Environmental Impact Statement (DEIS) for the proposed December, 1985 OCS lease offering in Bristol Bay, Alaska (Sale 92). NRDC has had a longstanding interest in OCS oil and gas issues in general and in the southeastern Bering Sea/Bristol Bay region in particular.

I. <u>Lease Sale 92 Should Be Cancelled</u>

NRDC strongly opposes offshore oil leasing in Bristol Bay at the present time. This position is based upon the following considerations.

A. <u>The Value of the Biological Resources of Bristol Bay</u>

According to the Department of the Interior's own assessment, the Bristol Bay estuary and the associated continental shelf possess the greatest concentration of birds, fish and marine mammals found anywhere on the North American continent (DOI, 1982). The acreage scheduled to be offered for lease in Sale 92 lies in the heart of this enormously productive region. Indeed, the Sale 92 area contains some of the most important and sensitive biological resources of the entire Bristol Bay region. These resources include the following.

<u>Fish</u>: The Sale 92 area contains the major red king crab reproductive site for the Bering Sea (Thorsteinson and Thorsteinson, 1984). The ex-vessel value of the red king crab fishery in 1981 was $169 million (NOAA, 1981).

Bristol Bay also supports the largest sockeye salmon fishery in the world (NMFS, 1980). Approximately 88 percent of all salmon entering streams around the Bering Sea pass through North Aleutian Shelf waters during migration (Thorsteinson and Thorsteinson, 1984). The total Bristol Bay salmon fishery, valued in excess of $250 million, is thought to employ 10,000 people. Native villages throughout southwestern Alaska depend heavily on salmon for subsistence.

Finally, the Sale 92 region supports several commercial fisheries for food and bait herring, and there is a potential for capelin to support a future commercial fishery along the north Alaska Peninsula (Barton, <u>et al.</u>, 1977).

<u>Birds</u>: The Sale 92 area encompasses one of the world's great bird migration crossroads. Izembek Lagoon, which contains the largest eelgrass beds in the world, is utilized by hundreds of thousands of migrating waterfowl each year. The nutrient-rich lagoons and bays on the north side of the Alaska Peninsula support in various seasons major portions of either the North American or Pacific flyway populations of several species of waterfowl, including black brant, emperor goose, and Stellar's eider. The coastal areas of the north shore are critical wintering and staging areas for huge numbers of waterfowl and shorebirds. A million birds have been recorded along the north shore of the Alaska Peninsula in fall. (Strauch and Hunt, 1982.)

<u>Marine Mammals</u>: At least 20 species of marine mammals are known to occur in the lease sale area. Approximately 4,000 sea

lions, 30,000 harbor seals, 15,000 walrus and 17,000 sea otters utilize Bristol Bay habitats during all or parts of the year (Frost et al., 1983). Virtually the entire eastern Pacific gray whale population, estimated at 15,000 - 17,000 individuals, and approximately 1.2 million northern fur seals (roughly 75% of the world population) migrate through Unimak Pass during their spring and fall migrations (Rugh and Braham, 1979; Leatherwood et al., 1983.)

2. Sensitivity of Affected Biological Resources. The Department estimates that one spill of 1,000 barrels or more will occur as a result of Sale 92 (DEIS at IV-B-1). In addition, there is a possibility of a catastrophic (greater than 100,000 barrels) spill (id).

Petroleum hydrocarbons are extremely toxic to a wide variety of organisms at very low concentrations. Oil spills can affect fish by inhibiting growth, disrupting feeding and reproduction, contaminating spawning areas, and blocking or delaying migrations. Direct contact with oil is usually fatal to birds. The pelage of sea otters and fur seals loses its insulative capacity when oiled, which can lead to death from hypothermia. Grooming oiled fur may result in ingestion of fatal amounts of oil. The effects of oil on whales are poorly understood, but the National Marine Fisheries Service (NMFS) has concluded that a major oil spill during peak gray whale migration periods or when right whales are present could drive both species to extinction (DEIS at IV-B-56). For fish, marine mammals and birds, elimination or contamination of food sources may result in stress due to reduced food availability or in the ingestion of hydrocarbons, with concomitant effects on behavior and reproductive success.

Prohibiting oil and gas leasing in the area excluded from leasing in Alternative IV in the DEIS will not ensure that oil will not be spilled in sensitive areas or transported to them by winds and storms during critical periods for fish and other wildlife.

In addition to spills, there are other activities associated with offshore oil and gas development that threaten fish and wildlife. Offshore seismic exploratory activity using airguns has been shown to modify the behavior of bowhead whales at distances of 50 km or more (Richardson, 1983). Drilling muds can have acute and chronic effects, particularly for benthic organisms. Formation waters can retain up to 50 ppm of oil as small droplets and up to 35 ppm as dissolved hydrocarbons -- well above lethal concentrations to larval and adult fish and crabs (.01 - 1 ppm) (DEIS at IV-B-2). Blasting, sand and gravel mining, aircraft traffic, cooling water discharge, construction, and other activities associated with the development of onshore support facilities could result in the abandonment of nesting, breeding or staging areas for birds and other wildlife as well as damage or destroy important salmon habitat.

3. Risks Associated with Development. Within the Bristol Bay uplands adjacent to the sale area, there are 11 active volcanoes; 6 on Unimak Island and 5 on the Alaska Peninsula. The Bristol Bay region is among the most seismically active in the world, with major and minor faults criss-crossing the ocean bottom. Earthquakes are common. Severe weather, frequent fog, winter ice, earthquakes and tsunamis all significantly contribute to a high probability for the occurrence of spills due to platform and tanker accidents. The regional circulation would probably transport oil along the north coast of the Alaskan Peninsula to the head of Bristol Bay. Mean wind direction in the area is either onshore or coast-parallel 9-10 months out of the year. In short, virtually all significant environmental factors would work in consort to increase the probability for and the degree of damage resulting from an oil spill or blowout. The Department of Interior has concluded that the effectiveness of oil spill response capability in the Sale 92 area is unpredictable (DEIS at IV-A-13).

4. Lack of significant hydrocarbon resources. DOI's conditional mean resource estimate for the Sale 92 area is 364 million barrels of oil and 2.62 tcf of gas. This represents 2% of the total U.S. OCS hydrocarbon reserve.* If gas is determined to be uneconomic in Bristol Bay, this figure falls to 1% of the total

* Using a conversion factor of 5.62 to convert from tcf of gas to billion barrels of oil equivalent (BOE). 2.62/5.62 = 0.466 billion BOE. 0.466 + 0.364 billion barrels of oil = .83 billion BOE. Total US OCS BOE = 36.8 billion BOE (DOI, 1983).

U.S. OCS hydrocarbon reserve. The risk to the priceless natural resources of Bristol Bay is clearly not worth the benefit in terms of hydrocarbons.

In terms of dollar value, it is clear that fish will contribute more than oil to the economy of the State of Alaska and the nation. Last year, the Congressional Budget Office estimated that a one-year delay in leasing in Bristol Bay would cost approximately $150 million in lost bonus bids.** The Department of the Interior estimated that the total cost of a one year delay (the discounted sum of revenues, less the cost of finding, producing and transporting the resource to market) is $200 million. As noted above, the value of the Bristol Bay salmon fishery alone is estimated at $250 million and is thought to employ 10,000 people. From an economic standpoint, then, it is clearly advantageous to preserve Bristol Bay as a revenue generator through fish rather than oil.

5. Data Gaps. Substantial data gaps have been identified by the State of Alaska and the United Fishermen of Alaska with regards to the impacts of oil development in Bristol Bay on red king crab, salmon, herring, capelin, bottomfish, gray whales, fur seals, Steller's sea lions, overwintering seabirds and waterfowl, staging waterfowl, and sensitive coastal and marine habitats. Information is also lacking regarding the capability of current

** June 26, 1984 CBO memo "CBO's Estimate of Restriction on OCS Leasing."

oil spill containment and cleanup technology to cope with spills in the Bristol Bay environment. Until these data gaps are filled, there is no way of knowing whether or not offshore oil activities in Bristol Bay can be conducted safely or what mitigating measures are required to protect sensitive biological resources.

Due to the importance of the biological resources of Bristol Bay, their sensitivity, the hazards associated with oil development, the relatively small amount oil in relation to the richness of the biological resources present, and the lack of information regarding the potential impacts of hydrocarbon development in Bristol Bay, NRDC strongly recommends that the Department cancel Sale 92.

II. The Sale 92 Draft Environmental Impact Statement

Should DOI decide to proceed with the lease sale process for Sale 92, there are a number of deficiencies in the DEIS that must be corrected. These deficiencies and our recommendations on how they should be addressed are outlined below.

A. The Delay Alternative

29-1a Based in part on the concerns discussed above, the State of Alaska has repeatedly requested that federal offshore oil and gas leasing in Bristol Bay be deferred until at least 1994. Yet the delay alternative in the DEIS is for only 5 years. We strongly

recommend that the delay alternative be extended from 5 to 10 years to more adequately reflect the concerns of the State and other groups.

B. The Analysis of Impacts

The National Environmental Policy Act (NEPA) requires that the EIS evaluate direct, indirect and cumulative effects of the proposed action on the environment. This assessment is to be used choosing among alternative actions and in the development and selection of appropriate mitigating measures (CEQ Regulations, §1502.14(f) and §1502.16). The impact analysis in the Sale 92 DEIS contains a number of serious deficiences which render its assumptions incomplete and its conclusions of doubtful validity. These deficiencies are outlined below.

1. Information Gaps.

29-1b As noted elsewhere in these comments, the Alaska Department of Fish and Game and the United Fishermen of Alaska have identified significant data gaps with regards to the impacts of OCS development in Bristol Bay on red king crab, salmon, herring, capelin, bottomfish, gray whales, fur seals, Stellar's sea lions, overwintering seabirds and waterfowl, staging waterfowl, sensitive coastal and marine habitats, and the capability of current oil spill containment and cleanup technology to cope with spills in the Bristol Bay environment. Having carefully reviewed the Alaska Department of Fish and Game's comprehensive analysis of these data gaps, NRDC concludes that there is insufficient information available to 1) adequately assess the impacts of OCS leasing on the Bristol Bay environment; 2) make a reasoned choice among alternatives; 3) develop adequate mitigating measures to protect vulnerable resources, and 4) properly balance the environmental risks versus the benefits to be accrued from leasing specific tracts. In accordance with 1502.22(a) of the CEQ Regulations, it is incumbent upon MMS to delay the Sale until it can collect information to fill the critical information gaps and include the information in a revised DEIS.

2. Averaging Impacts

29-2 The practice of averaging impacts over a wide area is misleading because it tends to minimize impacts on locally important fish and wildlife populations. This practice permits MMS to conclude that although activities may have serious consequences in local areas, regional populations will be altered minimally and the overall impact is "moderate" or "minor". This practice leads to erroneous conclusions, particularly when applied to species with particularly large or important local populations or of genetically separate stocks. This practice should be abandoned in favor of site specific environmental impact analysis for all resources assessed.

3. The Oil Spill Risk Analysis (OSRA)

The OSRA forms the basis for much of the impact assessment contained in the DEIS. However, due to the problems outlined below, the OSRA contained in the Sale 92 DEIS seriously underestimates the potential oil spill impacts of the sale.

29-3 a. The trajectories of spills are modeled for a maximum of 30 days. By limiting the assessment of dispersion and movement of oil spills to 30 days, the DEIS effectively assumes that all spills are cleaned up or disappear after this time and have no environmental effects.

This assumption is clearly erroneous and significantly underestimates oil spill impacts. There is no evidence that an oil spill of 1,000 barrels or more can be cleaned up in 30 days in the Bering Sea. Sohio spent 54 days cleaning up a much smaller spill (48-71 barrels) from Challenge Island during the summer of 1981 (Sohio, Challenge Island Spill Report, p. 11.1). Furthermore, Exxon has estimated a response time of 43-56 days to kill a blowout in the St. George Basin, which is adjacent to Bristol Bay. (Exxon Exploration Plan, OCS Lease Sale 70, p. 70.)

The DEIS further compounds its underestimation of oil spill impacts by basing a major portion of its impact assessment on 10-day spill trajectories (DEIS at IV-A-13). This gives an excessively optimistic view of oil spill impacts. Evidence in the OSRA itself (Appendix G) shows that probabilities of oil spill contact to important biological resources after 30 days are significantly greater than such probabilities after 10 days. Furhtermore, there is no evidence to support the assumption that oil can be contained and cleaned up in 30 days, much less 10 days. In effect, then, all but the very short term effects of an oil spill are ignored. This misleading picture must be corrected in the final EIS.

29-4 b. Has the Rand model ever been validated for conditions that exist in Bristol Bay? Specifically, has the model been validated for water temperature, type of crude oil, oil transport characteristics, wind and current trends, and ice conditions in Bristol Bay? If the model has not been validated for these conditions, what is the level of uncertainty associated with using it to predict trajectories in Bristol Bay?

29-5 c. The model used by MMS to predict trajectories in the DEIS is not state-of-the-art. The trajectory model ignores a whole host of important oil fate processes, including spreading, evaporation, dissolution, emulsification, dispersion, oxidation, biodegradation, and sinking/sedimentation. There are models, such as the University of Rhode Island-Georges Bank Model, that incorporate most or all of the other processes listed. To go to the trouble of using a very complex three-dimensional hydrodynamic model to estimate currents, and then to rely on an extremely simple "advected point" model to estimate where the spill will hit seems inconsistent. The trajectory analysis in the FEIS should take advantage of some of the more complex, more precise models that are available.

29-6 d. The repeated assumption that even the largest tanker spills will only affect an area of 200 km^2 (DEIS at IV-B-10-36) is erroneous and leads to a very significant underestimation of impacts. For example, the Argo-Merchant spill affected approximately 20,000 km^2 -- an area almost equal to the size of the entire Sale 92 area. It is quite possible that a large spill

could impact most or all of the Sale area. Thus the repeated assertions in the DEIS that spill impacts will be "localized" are without basis and should be removed.

29-7 e. The claim that spills of less than 1,000 barrels have "a very low persistence or environmental effect" (DEIS at IV-A-7) is totally without basis. The environmental effect of a spill is not solely dependent on its size, but also the characteristics of the oil and the sensitivity of the resources affected. The type of oil and where it is spilled are two critical determinants of persistence. This section should be re-written to include a discussion of the cumulative impacts of frequent small spills. A small spill rate should be calculated so that some estimate of the total amount of oil introduced into the Bristol Bay ecosystem via small spills can be assessed.

29-8 f. The FEIS should contain a discussion of the reliability of the trajectory model in predicting the transport of spilled oil in light of two major oil spills that occurred in 1984. On July 30th, the tanker Alvenus broke up 10 miles southwest of Calcasieu, Louisiana, releasing 10,000 tons of oil into the Gulf of Mexico. The oil spill trajectory model predicted the oil would stay at sea; instead it drifted towards shore. A similar scenario involving 34,000 gallons of refined oil spilled from the Puerto Rican took place this summer off of California's Sonoma coast. In its spill trajectory analysis, the U.S. Coast Guard predicted that the spill would travel south. The spill did exactly the opposite, sweeping northward through the Farallon

Islands National Marine Sancutary, leaving behind hundreds of fatally oiled birds and oil pollution along the coast.

A major part of the impact analysis contained in the DEIS is based on the trajectory model's predictions of what resources a spill will hit. Thus, the reliability of the model in predicting spill behavior is crucial to the validity of much of the impact analysis. The reliability of the model should therefore be discussed in detail in the FEIS.

29-9 g. The section on operational capabilities of oil spill response equipment (DEIS at IV-A-17) is very good. We recommend however, that the FEIS contain a discussion of the percentage of spilled oil that has been successfully recovered in previous major offshore spills so that the overall effectiveness of spill containment and cleanup activities can be assessed.

29-10 h. The lack of any launch points shoreward of the Sale area (Graphic 5) is a very serious omission that inevitably leads to an underestimation of the probability that a spill will hit those areas. Inclusion of launch points along expected transport routes outside the sale area is essential to assessing spill impacts, particularly considering that spill rates for transportation activities which will occur oustide the Sale area, are higher than those for platforms, which will be located in the Sale area. This situation must be corrected in the FEIS and the impact analysis for nearshore resources revised accordingly.

C. <u>Worst Case Analysis</u>

29-11 1. <u>Oil Spill Effects on Whales</u>.

The worst case analysis for oil impacts on gray whales appears to conclude that an uncontrolled blowout resulting in a massive spill would affect less than 10% of the gray whale population (DEIS at IV-J-3). This directly contradicts the March 21, 1984 Biological Opinion of the National Marine Fisheries Service (NMFS), which states that:

> an uncontrolled blowout or major oil spill during peak gray whale migration periods and when right whales are present is likely to jeopardize the continued existence of these species (DEIS at IV-B-56).

The FEIS should explain how it came to a conclusion so at odds with that of the expert agency. The FEIS should also be revised to reflect the assessment in the Biological Opinion that either a major oil spill <u>or</u> seismic disturbance could result in the extinction of gray and right whales.

2. <u>Pacific Black Brant</u>

29-12 The threatened Pacific black brant use the vast eel grass beds of Izembek Lagoon as critical staging areas. These geese feed for up to six weeks in Izembek Lagoon prior to flying non-stop to Baja California. Undisturbed feeding is critical to building up sufficient body fat to complete the 50-plus hour flight. Last fall, helicopters servicing platforms in the St. George Basin from bases in Cold Bay repeatedly overflew Izembek Lagoon, resulting in widespread disturbance of the black brant. Since the Department appears to be unwilling to invoke its authority to prevent harassment by aircraft in refuge airspace, a worst case analysis should be performed on the cumulative impacts of repeated and continued helicopter harrassment of threatened Pacific black brant in Izembek Lagoon as a result of present and future OCS activities in the St. George Basin, Navarin Basin and Bristol Bay.

3. Other Species

29-13 The FEIS should be revised to include a worst case analysis for other species, such as herring, for which there are gaps in relevant information or uncertainty with regards to impacts resulting from OCS activities.

D. Mitigating Measures

Bristol Bay is one of the nation's richest and most sensitive offshore areas. It supports millions of seabirds, shorebirds, marine mammals and waterfowl. It is the home of several endangered species and a commercial fishery of worldwide importance.

The potential for conflict between these vast resources and OCS oil and gas operations is enormous. Mitigating measures are necessary to minimize these conflicts to the maximum extent possible. The mitigating measures outlined in the Sale 92 DEIS are totally inadequate in this regard. As proposed, the mitigating measures contained in the DEIS provide very little real protection to fish and wildlife resources, habitats and harvest activities. NRDC recommends the following changes and additions.

1. Protection of Biological Resources.

Stipulation No. 3 instructs operators to protect any important biological resources discovered during the course of operations, yet the stipulation fails to require any environmental monitoring. This is a very significant loophole that must be closed in the FEIS. Pre-drilling surveys should be required of all operators so that an adequate determination can be made regarding whether or not important biological resources are present and require protection. NRDC very strongly recommends that Stipulation No. 3 be strengthened and revised in the following manner:

29-14 a. A seasonal drilling restriction should be imposed around Unimak Pass, Unimak Island and the Alaska Peninsula to protect populations of sea birds, fur seals and other sensitive marine organisms that congregate in these areas in large numbers at certain times of the year. Such a drilling restriction should be developed in conjunction with, and subject to the approval of, the Bering Sea Biological Task Force.

29-15 b. The first paragraph of the proposed stipulation should be changed to read:

> Prior to the commencement of any drilling activity or construction or placement of any structure for exploration or development activities, the lessee shall conduct site specific environmental surveys to determine if biological populations or habitats require additional protection. If these studies indicate that additional protection may be necessary, then more detailed studies shall be conducted to determine the extent and composition of biological populations or habitats, and the effects of proposed and existing operations on the populations or habitats which might require additional protective measures. Such a decision will be made in consultation with the Bering Sea

Biological Task Force. The Regional Supervisor, Field Operations (RSFO) shall notify the lessee in writing of his decision to require such surveys in a timely fashion.

e. The second paragraph should be amended to read:

Based on the surveys described above or on other information available to the RSFO on special biological resources, the RSFO may require the lessee to: (1) relocate the site; (2) establish to the satisfaction of the RSFO and the Bering Sea Biological Task Force that the operation will not have a significant adverse effect upon the resource identified; (3) operate during those periods of time that do not adversely affect the biological resources as established by the RSFO and the Bering Sea Biological Task Force; and/or (4) modify operations to ensure the significant biological populations or habitats deserving protection are not adversely affected. <u>Additional periodical sampling of environmental conditions during operations may also be required.</u>

2. <u>Protection of Endangered Whales</u>

From April through June and from November through January, virtually the entire world population of gray whales is thought to migrate through Unimak Pass. The National Marine Fisheries Service (NMFS) believes that a major oil spill in this area during migration is likely to jeopardize the continued existence of the species (DEIS at IV-B-56).

29-16 The Information to Lessees (ITL) on endangered whales contained in the DEIS is totally inadequate to protect gray whales. If DOI proceeds with Sale 92, NRDC strongly recommends that DOI adopt, <u>at a minimum</u>, a 50 mile buffer around Unimak Pass, Unimak Island and the Alaska Peninsula as the preferred alternative. Such a deferral would be consistent with NMFS' recommendations in the Biological Opinion (Appendix H, page 6).

29-17 NRDC further recommends that DOI impose a seasonal drilling restriction based on the recommendations of NMFS in its

Biological Opinion (<u>id</u>.). This stipulation should read:

drilling, seismic, production, workover and transportation activities within 100 miles of Unimak Pass should be prohibited 1) during the spring (April 1 to June 30) and fall months (November 1 to January 31) when the entire gray whale population migrates through these waters, and 2) whenever right whales are present.

Some whales may be in the area before or after these dates. Aerial or other surveys should be conducted to insure that endangered whales are not in these areas. Visual inspection from platforms is not an adequate survey technique, as visibility in Bristol Bay can be severely restricted for weeks at a time. The seasonal restriction to protect Unimak Pass and the Peninsula must allow sufficient time for drilling of relief wells and oil spill cleanup before the whales re-enter the area.

For both gray and right whales, drilling and seismic activities should be suspended whenever these whales are within an area determined by the Bering Sea Biological Task Force to be near enough to be subject to disturbance from offshore oil and gas activities. This stipulation is particularly crucial to protect right whales, which are on the brink of extinction.

3. <u>Oil Spill Response</u>

29-18 An oil spill response stipulation should be included in the FEIS which requires:

(a) The continuous provision of the best available technology to detect, contain, clean up and dispose of spilled oil under all environmental conditions in which drilling will occur that can be deployed within 24 hours, unless trajectories indicate that oil will contact sensitive fish and wildlife resources sooner than 24 hours, in which case the response times will be reduced to assure adequate protection of the fish and wildlife resources at risk.

(b) The dev lopment of a relief well plan prior to the approval of exploration plans that defines specific response actions to be taken in the event of a blowout. The relief well plan must identify alternative drilling rigs capable of operating in the Bristol Bay environment and specify the response times required to move an alternative drilling rig to the site and to mobilize, drill and complete a relief well.

(c) The development of a habitat protection plan prior to approval of exploration plans that identifies important fish and wildlife habitats and migration routes and details plans for their protection in the event of a spill.

(d) The use of an oil spill containment boom whenever any vessel is loading or unloading oil either offshore or in port. The boom must be capable of operating effectively in all conditions under which loading or unloading will take place.

(e) During conditions of extreme winds, waves and/or broken ice when industry cannot demonstrate the <u>physical</u>, as well as theoretical, ability to contain and clean up spilled oil, the RSFO will temporarily suspend drilling, well testing, offshore loading, and all other operations which have the possibility of causing an oil spill until such conditions abate.

In meeting this standard, Interior should recognize that demonstration of offshore cleanup techniques on onshore areas, or under unrealistic conditions, is not sufficient. In the past, tests of equipment and cleanup strategy have only been conducted on a small scale and under favorable conditions in the Arctic. (Furthermore, even these tests have raised serious questions about cleanup capability. The tests conducted by the State of Alaska in June and July 1983 show that industry encountered serious problems in burning oil, deploying booms and rope mops, and maneuvering barges). The results of those tests cannot be confidently extrapolated to real world conditions, especially in

broken ice, where industry has no experience or proven technology.

4. <u>Stipulation on Testing of Oil Spill Containment Equipment</u>

The Final Notice of Sale (FNOS) for Sale 80 in Southern California requires that oil spill containment and cleanup drills and equipment tests be periodically conducted. This stipulation (No. 10) should apply to all leases in Bristol Bay. It is reproduced below.

29-19

> The lessee shall conduct semi-annual full-scale drills at the request of the lessor for platforms and operator-controlled contracted cleanup vessels for deploying equipment in open water to test the equipment and the [oil spill] contingency plan. These drills must involve all primary equipment identified in the oil spill contingency plans as satisfying Outer Continental Shelf Operating Order No. 7. At least two of these drills shall include the primary equipment controlled and operated by the appropriate cooperative. These drills will be unannounced and held under realistic environmental conditions in which deployment and operations can be accomplished without endangering safety of personnel. Representatives of the U.S. Coast Guard, Minerals Management Service, and the [State of Alaska] may be present as observers. The lessor's inspectors will frequently inspect oil and gas facilities where oil spill containment and cleanup equipment are maintained in order to assure readiness.

5. <u>Protection of Commercial Fisheries</u>

The Sale 80 FNOS contains a stipulation (No. 12) to protect fisheries. This stipulation, which has been reproduced below in

29-20 modified form to address subsistence issues, should apply to leases in the Sale 92 area.

(a) The lessee, operator(s), subcontractor(s), and all personnel involved in exploration, development, and production operations shall endeavor to minimize conflicts between the oil and gas industry and the commercial and subsistence fishing industry.

Prior to submitting a plan of exploration or development to the lessor, appropriate oil and gas personnel shall contact potentially affected commercial and subsistence fishermen or their representatives to discuss potential conflicts with the siting, timing, and methods proposed. Through this consultation the lessee shall assure that, whenever feasible, exploratory and development activities are compatible with seasonal fishing operations and will not result in permanently barring commercial or subsistence fishing from important fishing grounds.

A discussion of the resolutions reached during this consultation process and a discussion of any unresolved conflicts shall be included in the Plan of Exploration or Development/Production. The lessee shall send a copy of the Plan of Exploration or Development/Production to affected commerical and subsistence fishermen or their representatives at the same time they are submitted to the lessor to allow concurrent review and comment as part of the lessor's plan approval process.

(b) In particular, the lessee shall show in the Plan of Exploration or Development/Production crew and supply boat operation routes which will be used to minimize impacts to fishing, marine mammals, and endangered and threatened species. Conflicts foreseen in the planning stages or that develop later shall be resolved whenever feasible and as quickly as possible.

(c) The lessee also shall include in the Plan of Development/Production analyses of the effects of its operations on the allocation and use of local dock space by fishing boats and crew and supply boats. These analyses shall include present (baseline) uses, predicted oil and gas uses which increase the level of demand, and an assesment of individual and cumulative impacts. Conflicts foreseen in the planning stages or that develop later shall be resolved whenever feasible and as quickly as possible.

(d) The lessee shall be required to employ jack-up drilling rigs for drilling exploratory wells in primary fishing trawl grounds as determined by the Regional Manager (RM). The RM may approve other drilling vessels when geological or bottom conditions prohibit the use of jack-ups. When considering the use of other drilling vessels, the RM will consult with the [State of Alaska] to determine the effects of the vessels on commercial and subsistence fishing.

(e) All activities associated with exploration and development operations shall be conducted to avoid the creation of obstacles to commercial and subsistence fishing operations. If the RM has reason to believe that the site has not been adequately cleared, additional surveys shall be required to detect the location of any obstacles to fishing.

6. <u>Disposal of Muds, Cuttings, and Formation Waters</u>

NRDC recommends that the following stipulation be proposed in the FEIS.

The RSFO may require the lessee to dispose of drill cuttings and drilling muds by shunting the material to a depth and location below the ocean surface as specified by the RSFO, or by transporting the material to disposal sites approved by the

29-21 Environmental Protection Agency.

Based upon the composition of produced formation waters, the site specific environmental conditions in the leasing area, and the data obtained from the surveys and studies established pursuant to the stipulation for the Protection of Biological Resources, as well as data from other relevant sources, the RSFO may require the lessee to reinject formation waters. The RSFO shall provide written notice to the lessee of a decision to require reinjection of such formation waters.

7. <u>Vessel and Aircraft Restrictions to Protect Endangered Species</u>

The Biological Opinion prepared by NMFS for Sale 70 included

29-22 a set of guidelines which must be followed to prevent harassment of endangered whales. These quidelines, which are listed below, should be proposed in the FEIS.

> Vessels and aircraft should avoid concentrations or groups of whales. Operators should, at all times, conduct their activities at a maximum distance from such concentrations of whales. Under no circumstances, other than an emergency, should aircraft be operated at an altitude lower than 1,000 feet when within 500 lateral yards of groups of whales. Helicopters may not hover or circle above such areas or within 50 lateral yards of such areas.
>
> When weather conditions do not allow a 1,000 foot flying altitude, such as during severe storms or when cloud cover is low, aircraft may be operated below the 1,000 foot altitude stipulated above. However, when aircraft are operated below 1,000 feet because of weather conditions, the operator must avoid known whale concentration areas and should take precautions to avoid flying directly over or within 500 yards of groups of whales.
>
> When a vessel is operated near a concentration of whales the operator must take every precaution to avoid harassment of these animals. Therefore, vessels should reduce speed when within 300 yards of whales and those vessels capable of steering around such groups should do so. Vessels may not be operated in such a way as to separate members of a group of whales from other members of the group.
>
> Vessel operators should avoid multiple changes in direction and speed when within 300 yards of whales. In addition, operators should check the waters immediately adjacent to a vessel to ensure that no whales will be injured when the vessel's propellers [or screws] are engaged.
>
> Small boats should not be operated at such a speed as to make collisions with whales likely. When weather conditions require, such as when visibility drops, vessels should adjust speed accordingly to avoid the likelihood of injury to whales.

In addition, aircraft restrictions should be proposed that will protect threatened and endangered birds.

8. Vessel Traffic Corridors

29-23 DOI should work with the Coast Guard to establish mandatory vessel traffic corridors for drilling rigs in transit, tankers, support vessels, and other vessels, in order to minimize conflicts between vessels and sensitive marine mammals, birds, and fish species.

E. Miscellaneous Comments

NRDC requests that a map showing areas of high, medium and low industry interest be included in the FEIS. We make this request based on the following considerations.

29-24 First, indications of industry interest give an approximate idea of what portions of the Sale area are likely to be leased. This in turn has a direct bearing on the environmental impact analysis and the public's review of the analysis. A map of industry interest would permit us to focus our evaluation of the EIS on areas likely to be leased, rather than on the entire 5.6 million acre sale area.

Second, the Outer Continental Shelf Lands Act and Amendments (OCSLAA) require that the Secretary of the Interior:

> select the timing and location of leasing...so as to obtain a proper balance between the potential for environmental damage, the potential for the discovery for oil and gas, and the potential for adverse impact on the coastal zone (Section 18(a)(3)).

29-25 For the public to be able to assess the adequacy of the balancing process, it must have access to the information about the potential for the discovery of oil and gas. Indications of industry interest included in the EIS would permit the public to undertake this assessment. As it stands, the industry and the coastal states have access to information on industry interest, but the public does not. MMS has provided maps of industry interest to NRDC for a number of sales, so clearly the information contained in the maps is not considered proprietary by the industry. We therefore see no reason why the Sale 92 FEIS should not include a map of industry interest. The map should identify interest on a block by block basis.

NRDC also requests that MMS include an estimate of the cost of the 22 month lease sale process for Sale 92.

Thank you for considering these comments.

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Response 29-1a

A delay of leasing until 1994 would be the same as cancelling the sale, in that a delay of approximately 10 years would extend beyond the current and next 5-year leasing schedules. A "no-sale" alternative is analyzed in the EIS (Sec. IV.C.).

The State of Alaska asserts that a delay of 10 years would allow sufficient time to obtain necessary information to adequately assess effects on marine biota in this region. The MMS is currently in consultation with the state concerning this issue. An analysis of the adequacy of information necessary to perform an assessment of effects will be provided to the Secretary of the Interior prior to a decision concerning this lease sale. The alleged "data gaps" are identified and discussed in the EIS. Where appropriate, worst-case analyses have been performed (Sec. VI.J.).

Response 29-1b

The MMS does not agree that there is insufficient information available to adequately assess the effects of OCS leasing in the North Aleutian Basin, as evidenced by the extensive and thorough treatment given to the analysis of each resource topic in the EIS. This statement does not mean to imply, however, that there is perfect knowledge on these topics. Therefore, the MMS acknowledges that information is lacking in certain areas, but the total information base is not insufficient to perform a responsible assessment of effects from oil and gas leasing in this region. In fact, there is probably more known about the biological resource (particularly fisheries) in this region than any other region in Alaska. Since 1974, the MMS alone has spent more than $6.4 million on environmental and social and economic research in the North Aleutian Basin. This does not include millions more spent on generic studies or studies in other planning areas that could be directly or indirectly applied to the assessment of effects. In addition to these studies, the U.S. Fish and Wildlife Service, the National Halibut Commission, the Alaska Department of Fish and Game, and the National Science Foundation have conducted extensive research efforts.

In response to the issue of "information needs," the MMS began consulting with the State of Alaska and the United Fishermen of Alaska (UFA) in August 1984. From this consultation effort a list of "information needs" was identified by both groups. The MMS responded by preparing a staff paper that summarizing the available information on all of the specific "information needs" pertaining to fisheries cited by these two groups. The state and the UFA were provided the opportunity to respond and critique the MMS staff paper, and provide their own versions. The MMS and will provide these analyses to the Secretary of the Interior as

part of the decisionmaking process. Those analyses are incorporated expressly throughout the FEIS. This consultation effort has resulted in extensive revisions and additions to the FEIS.

In accordance with Paragraph 1502.22(a) of the Council on Environmental Quality (CEQ) Regulations, which implement NEPA, an agency includes information in an EIS "if the information relevant to adverse impacts is essential to a reasoned choice among alternatives and is not known and the overall costs of obtaining it are not exorbitant." Paragraph 1502.22(b) goes on to say that, if the overall costs are exorbitant and the means to obtain it are not known, ". . . the agency shall weigh the need for the action against the risk and severity of possible adverse impacts were the action to proceed in the face of uncertainty. If the agency proceeds, it shall include a worst-case analysis and an indication of the probability or improbability of its occurrence."

The MMS believes that the requirements of the CEQ Regulations have been met in this EIS. First, the MMS does not agree that the information needs raised by the state and the UFA are "essential to a reasoned choice among alternatives." More information would certainly enhance the assessment process, but would not necessarily be needed to cover the points raised by the state and the UFA. Conservative assumptions have been made in the analysis; for example, in the cases where little or nothing is known concerning the effects of hydrocarbons on a particular lifestage, it is assumed that hydrocarbons in any concentrations would result in mortality. In cases where there is little known concerning distribution of certain species or lifestages, the assumption is made that oil would contact the resource at the time and place in which it is most vulnerable. Concerning the capability of the oil industry to cleanup oil in the Bering Sea environment, the assumption used in the analysis is that no clean up takes place. By making these conservative assumptions, the effects on various resources probably are overestimated. If it were possible to obtain this information, the analysis could be enhanced, but probably would show lower effects.

In addition, the EIS contains two worst-case analyses (Sec. IV.J.). First, a worst-case analysis has been included for both oil-spill effects and seismic-noise effects for the two species of endangered whales (gray and right) designated to be in jeopardy by the National Marine Fisheries Service (NMFS) biological opinion. Second, a worst-case analysis of the effects of a catastrophic oil spill on all important biological resources has been provided. In view of the discussion above concerning the treatment of the "information needs," the MMS believes that it has fulfilled the requirements of the CEQ Regulations (in particular Paragraph 1502.22). Thus, the Secretary of the Interior has the necessary information to make a decision concerning this action, even in the face of uncertainty.

Response 29-2

This concern is addressed in Responses 15-18 and 15-19.

Response 29-3

The duration of oil spillage differs from the duration of a slick once oil has been spilled. The Challenge Island spill occurred on land and, thus, cannot effectively be compared with an offshore spill. The relationship of how many days it takes to clean up a spill on land, versus how long the trajectory of an oil slick can be tracked or monitored on the ocean, is not clear. Other aspects of this concern are addressed in Responses 4-6, 4-73, 4-74, and 6-125 (relating to length of trajectories), and 1-21 and 1-64 (relating to cleanup).

Response 29-4

The Rand model, initially developed for use in Bristol Bay, reflects over 10 years of continued development and refinement, in addition to an equivalent number of years of model-related oceanographic and meteorologic studies. The model has been validated for the conditions listed by the commentor (see Fig. IV-1).

Response 29-5

The state-of-the-art Rand model (Fig. IV-1) is much more complex than the Georges Bank model, which (for example) has no ice or ice movement and does not take into account the effect of melting ice on oil circulation and transport (see Response 6-111).

Other aspects of this concern are addressed in Response 6-120.

Response 29-6

This concern is addressed in Response 6-124.

Response 29-7

This concern is addressed in Response 4-67. The average spill of less than 1,000 barrels is projected to be 4.4 barrels in size, for a total of about 22 barrels per year (Sec. IV.A.1). This amount is an insignificant addition to the ongoing rate of nonoil-industry spillage in the southern Bering Sea (see Response 4-73).

Response 29-8

This concern discusses two different types of trajectory models that have very different purposes. The trajectory model used to track the Alvenus and Puerto Rican spills is an oil-spill-

response model. Such models are designed to be modified quickly to simulate the likely trajectory of a real spill that has occurred at a known location. Because this model must be readily and quickly adapted to simulate the geography, oceanography, and meteorology of a spill anywhere, data requirements of the model must be very simple and data must be readily available to the modeler. This model erred in predicting the trajectory of the Puerto Rican spill because its rapid-input data base did not account for the Davidson Counter-Current (Oil Spill Intelligence Report, 1985).

The trajectory model for the Alvenus spill erred for an even simpler reason: the winds and weather simulated in such models and used to drive the simulated oil slick are based on (1) the current winds and weather, and (2) the predicted future winds and weather. The prediction for the Alvenus-spill model--that oil would not reach shore before August 5, 1984--was based on the prediction that the weather pattern of July 31 would continue (Oil Spill Intelligence Report, 1984b). However, the weather changed and oil contacted the shoreline on August 3 (Oil Spill Intelligence Report, 1984c).

Neither of these failure modes of the oil-spill-response models apply to the type of oil-spill-trajectory model used in the Alaska OCS Region EIS's. The geography and oceanography data in models built for site-specific planning and assessment purposes are much more complex and accurate than those in spill-response models. The site-specific oceanography, meteorology, and geography data used in the spill-response models for the Alvenus and Puerto Rican spills were compiled and added to the model within a period of a few hours. The Rand model used in the Alaska OCS Region EIS trajectory analysis was developed specifically for Bristol Bay, and continuous further development and data compilation for the model have been ongoing for over 10 years. For assessment purposes, the weather submodel of the trajectory model simply presents a suite of the different possible trajectories that could result from the known, historical range in weather for the study area. In comparison, the spill-response model presents a single trajectory based on the predicted future weather.

Further discussion of the Rand model has been added to Section IV.A.3.c. of the FEIS and also to Responses 14-5, 4-71, 6-111, 6-115, 6-116, 6-119, and 6-120.

Response 29-9

The suggested discussion has been added to Section IV.A.4. of the FEIS.

Response 29-10

The MMS agrees that the lack of hypothetical launch points shoreward of the proposed lease sale area minimizes oil-spill risk to the Alaska Peninsula. This risk reduction is one reason why the shoreward lease blocks are excluded from the proposed sale. All platform sites and almost all of the offshore-pipeline routing would necessarily occur within the proposed lease sale area.

The only location where a pipeline would approach the Alaska Peninsula is between Launch Point D1 (Graphic 5) and Port Moller. This distance represents only a small portion of total pipeline length and spillage potential. Also note that this entire pipeline segment, including Launch Point D1, is within Biological Resource Area 7 (see Appendix G, Fig. G-2) and, therefore, has essentially a 100-percent (greater than 99.5%) conditional probability of contacting this resource area. This 100-percent conditional probability means that, in the combined-probability calculations, all spillage projected to occur in this pipeline segment (represented by Launch Point D1) is assumed to contact Biological Resource Area 7, the Port Moller area. Thus, the oil-spill-risk analysis conservatively assumes that all spills in the pipeline corridor between the lease sale area and shore will contact this nearshore resource area.

Response 29-11

The statement concerning the number of gray whales affected (less than 10%) is taken out of context and refers only to those whales that would be summer feeding in Port Moller Lagoon. As stated earlier in the analysis (Sec. IV.B.1.d.of the DEIS), "Approximately 10 percent of those whales will remain in the Bristol Bay area to feed in estuaries and other nearshore areas during the summer." Therefore, the percent of whales summering in Port Moller would have to be less than the 10 percent of the whales summering throughout Bristol Bay. The NMFS biological opinion does not state that either a major oil spill or seismic disturbance could result in the extinction of gray and right whales. The extinction of the gray whale population, due to exposure to a major oil spill or a seismic disturbance, is very unlikely. The historically rapid population increase of gray whales has occurred in spite of exposure to a major oil spill (Santa Barbara, 1969) and exposure to 35 years of seismic activity along the California coastline.

The NMFS biological opinion judges the significance of the possible effects of the proposed scenarios. The EIS produces an estimate of potential effect, but does not address the significance of that effect. The biological opinion is the NMFS opinion about the degree of seriousness of the potential effect. The MMS makes every effort to implement reasonable and prudent alternatives to avoid jeopardizing the continued existence of a particular targeted species. Therefore, the EIS conclusions of effects on gray and right whales (estimate of effect) are not contrary to the NMFS biological opinion (significance of effect).

Response 29-12

Refer to Responses 1-16 and 7-7 for a discussion of Izembek Lagoon. A more detailed analysis of potential site-specific disturbance effects on brant in the Izembek National Wildlife Refuge (NWR) has been included in Section IV.B.1.a.(2) of the FEIS. At present, the combination of (1) Information to Lessees (ITL) on Bird and Marine Mammal Protection, (2) stated operating procedures in the lessees' exploration plans, (3) conditions imposed on the lessees by the MMS in exploration-plan-approval letters, and (4) information agreements between Izembek Refuge personnel and lessees, appears to provide the most realistic means to mitigate the potential effects on brant, while also protecting human safety. The authority to regulate aircraft altitudes under IFR conditions rests with the Federal Aviation Administration as set forth in 49 U.S.C. 1348 and 14 CFR, Part 95. At this time, the brant is not listed as a threatened species by the Fish and Wildlife Service (FWS).

Response 29-13

The analysis of the effects of the proposal indicate that the effects of a large oil spill (100,000 barrels) contacting the Port Moller area would have a major effect on the regional herring populations.

A worst-case analysis of herring is discussed under the 100,000-barrel-oil-spill scenario in Section IV.J. of the FEIS.

Response 29-14

Based on the existing information on the North Aleutian Basin and the analysis of effects for this EIS, the need for a seasonal-drilling restriction is not evident. Neither the NMFS nor the FWS requested a seasonal-drilling restriction for this sale. However, if populations and/or habitats should require additional protection (such as a seasonal-drilling restriction) because of their sensitivity or vulnerability to any lease operations, Stipulation No. 3 (Protection of Biological Resources) provides that the Regional Supervisor, Field Operations (RSFO), may require lessees to conduct a biological survey to determine the extent and composition of biological populations or habitats. Based on these surveys, the RSFO may require the lessee to: "(3) operate during those periods of time that do not adversely affect the biological resources." Also, the ITL on the Bering Sea Biological Task Force (BTF) states that the RSFO will consult with the BTF on the conduct of biological surveys and appropriate course of action after surveys have been conducted.

Response 29-15

The use of the word "shall" would be inappropriate because it implies that biological surveys will be required in all cases, which is not necessarily true. The suggested word change also could be construed to mean that surveys would be required for scientific purposes not necessarily related to the site or the lessee's proposed activities, which is not the intent of the subject stipulation. Biological surveys may be required if a significant biological population or habitat is known to exist, or if there is reason to believe that a special biological population or habitat may exist in the area of proposed operations, which may require additional protective measures. Where a biological population or habitat is known to exist in the area, and there is sufficient information to assess potential effects from proposed activities, it is considered in the review of a proposed activity and, in most cases, need not require a biological survey, unless uncertain or unique circumstances warrant more detailed information. Retaining the word "may" allows the RSFO flexibility in making such determinations and precludes the conduct of unnecessary or unwarranted biological surveys.

The inclusion of the BTF in the stipulation, with joint decisionmaking responsibility with the RSFO under the stipulation, would be unnecessary and inappropriate, because the BTF is consulted on each area and activity as described in the ITL on the Bering Sea BTF. The purpose of the BTF is to provide biological expertise to the RSFO that would be included in the decisionmaking process; however, the BTF is not intended to be a decisionmaking body. During the regulatory review of an Exploration Plan (EP) or Development and Production Plan (DPP) and preparation of NEPA documentation, information on biological resources and other environmental considerations also is provided by reviewing federal and state agencies, the public, and MMS staff personnel, and is incorporated into the decisionmaking process. The BTF represents one source of information and recommendations on the biological aspects of a proposed plan. Under the 30 CFR 250.34 regulations, the final approval authority for an EP or DPP rests with the RSFO. The RSFO must utilize all available and relevant information, including BTF recommendations, in the decisionmaking process. The role of the Bering Sea BTF has been well established in the Notices of Sale for Sales 57, 83, and 70.

The recommendations on additional sampling during operations are unnecessary because the proposed stipulation does not preclude conduct of periodic biological surveys in the event that a unique biological population or habitat is identified. The need for periodic surveys would be determined on a case-by-case basis in consulation with the BTF and after considering federal and state recommendations, MMS information, and staff recommendations, and based on the type of activity proposed, the location, and the time of year when operations would be conducted. For example, Exxon was required to conduct monitoring of its BF-37 gravel island construction and abandonment activities in the Sale BF area to determine what effects, if any, the island had on the

nearby boulder-patch area. Similar requirements for surveys and monitoring may be imposed on operations in the Sale 92 area by the RSFO, after taking into consideration the proposed activity to be permitted and any recommendations from the Bering Sea BTF and all other sources of information.

Response 29-16

The Secretary of the Interior has the option to impose a 50-mile buffer around Unimak Pass, Unimak Island, and the Alaska Peninsula. The most recent NMFS biological opinion (March 21, 1984) did not propose a 50-mile buffer around these areas as a reasonable and prudent alternative for the protection of gray whales from noise disturbance. The 50-mile buffer may not need to be as great as proposed to adequately protect migrating gray whales. Notice to Lessees (NTL) 83-4 prohibits seismic surveys on leases within 20 miles of Unimak Pass between April 1 and June 30, and between October 31 and December 31. The data indicate that, on their northbound migrations, gray whales are located between the shore and 5 kilometers seaward, with most occurring in the 1- to 0.5-kilometer range. Experiments conducted off California recorded the responses of migrating gray whales to geophysical seismic activities. It was found that the whales reacted only when received levels were high (greater than 160 dB). The reactions consisted of decreased migration speeds, movement away from the noise source, and increases in respiration rates. Migration-route deflection began at 2 to 3 kilometers for some whales, and a 90-percent avoidance of the noise source occurred when the whales were 1.2 kilometers away. Therefore, it appears that an active seismic vessel would have to be closer than the proposed 50-mile buffer before behavioral changes occurred in gray whales.

Response 29-17

The Secretary of the Interior has the option to impose a seasonal-drilling restriction within 100 miles of Unimak Pass for the 6 months suggested by the commentor. The NMFS biological opinion (March 21, 1984) recommended adopting the MMS's proposed 50-mile deferral area around Unimak Pass that is incorporated in Alternative IV. Since a seasonal-drilling restriction was not implemented for the St. George Basin (Sale 70) leases, it may not be prudent to require such a restriction in the North Aleutian Basin. In the area currently under consideration for leasing (Alternative I), the block closest to Unimak Pass is approximately 42 miles away.

Response 29-18

The Alaska OCS Orders and guidelines for approval of oil-spill-contingency plans, developed jointly by the MMS and the U.S.

Coast Guard (USCG), include the same, similar, or more stringent requirements than those proposed in the stipulation.

The OCS Lands Act established requirements for utilization of Best Available and Safest Technology (BAST) on the OCS. This requirement is repeated in the 30 CFR 250 regulations. The BAST requirement is applicable to oil-spill-contingency technology and is reflected in the planning guidelines, which require that equipment be deployable in 5- to 6-foot seas and operable in 8- to 10-foot seas and 20-knot winds. To allow the opportunity to assess the applicability and capability of contingency equipment and techniques described in the oil-spill-contingency plans, the plans are subject to a review that includes the USCG, the state (for coastal-zone-consistency certification), and the public.

The planning guidelines also require that response equipment be available in 6 to 12 hours, unless a risk analysis indicates that an oil spill will contact the shoreline sooner. Additional support equipment must be available within 48 hours. The planning guidelines and OCS Order No. 7 require a risk analysis that includes identification of important and critical biological resources and habitats. The proposed ITL on Areas of Special Biological Sensitivity identifies critical biological habitats that the lessee must consider in the risk analysis and in contingency planning.

OCS Order No. 2 requires lessees to submit provisions for dealing with emergency situations (including loss or disablement of the drilling unit and a means of drilling a relief well should a blowout occur) with an exploration or development and production plan. This plan may include documentation of commitments between companies for use of each other's rig when both companies are operating in the same area at the same time; or the plan may include documentation of the location, status, and time required to bring another rig to the emergency location.

Specific contingency measures for fuel-transfer spills are identified in the oil-spill-contingency plan. Fuel-transfer spills typically are of limited volume and are cleaned up with sorbent pads. A boom surrounding a vessel would be difficult to deploy in a stationary mode, because winds and current could prevent the boom from maintaining a useful configuration around the vessel. In the event of a large spill, a boom would be deployed around the spill and allowed to move with the oil, while sorbent pads or skimmers recovered the oil.

When environmental conditions approach the operational limitations of a drilling unit, lessees must submit criteria under which operations would be curtailed or modified. Many operations, such as fuel-transfer operations or well testing, are unlikely to be conducted during environmental conditions that

exceed oil-spill-contingency capabilities. During a higher-sea state, oil would disperse naturally. Drilling actions generally occur during the summer months when higher-sea states are infrequent or of short duration.

The spill rates used in this EIS cover data from 1964 through 1981, and the application of trend analysis to the data indicates improved performance in some areas; however, performance would appear to have declined in blowouts. Analysis of data in a recent USGS paper (Fleury, 1983) shows an average of 3.61 blowouts per 1,000 wells from 1979 to 1982. This average is higher than the 3.12 average blowouts per 1,000 wells over the prior 23 years.

Pipelines and loading facilities are subject to a separate review-and-approval process. The development and production plan is required to identify the method of transportation and location of transportation facilities, including pipelines, and will require grants of right-of-way or easements that are subject to environmental review under the National Environmental Policy Act and technical review by the MMS and the Department of Transportation. The development and production plan is reviewed by the state and must receive coastal-zone-consistency certification prior to commitment to production activities. These procedures allow the MMS and the state to identify appropriate pipeline routes and onshore-landfall sites on a case-by-case basis. This EIS includes proposed Stipulation No. 5 (Transportation of Hydrocarbons), which provides for construction of pipelines when environmentally preferable and acceptable.

Response 29-19

Alaska OCS Order No's. 2 and 7 give specific requirements on oil-spill and pollution prevention. Order No. 2 establishes casing and casing-cement requirements, blowout-prevention-equipment specifications, mud-program testing and control requirements, and a mandatory program for supervision and surveillance of activities and training of personnel. Order No. 7 establishes requirements for liquid- and solid-waste disposal, personnel training and drills for pollution prevention, and pollution inspections and reports. Because OCS Orders are considered standard mitigating measures that are part of the proposed action, the MMS does not feel that there is a need for additional stipulations concerning the testing of oil-spill-containment equipment.

Response 29-20

The "Protection of Commercial Fisheries" stipulation proposed by the commentor is not necessary to mitigate the types of conflicts that could potentially occur between the two industries, or between the oil industry and subsistence users. Mitigating measures are proposed in the EIS that respond to the concerns presented by the commentor. Stipulation No. 2 (Orientation Program) requires lessees to develop a program that would inform workers of ways to avoid conflicts with commercial fishing, and to increase the understanding and sensitivity of workers to community values, customs, and lifestyles of the region. Stipulation No. 4 (Wellhead and Pipeline Requirements) is designed to mitigate effects to trawling gear employed by commercial fishermen. The ITL on Information on Potential Gear Conflict with Commercial Fishing Industry encourages lessees to advise commercial fishermen of their plans and to discuss mutually satisfactory ways to resolve conflicts.

The Oil/Fisheries Group of Alaska was established for the purpose of Mitigating conflicts between the two industries. This organization is comprised of members from both the oil and fishing industries. Thus far, activities of this group have been successful in meeting the stated purpose without government intervention.

Response 29-21

The discharge of effluents during exploratory operations in the Bering Sea is regulated by the Environmental Protection Agency through their NPDES permits. The decision to reinject formation waters or discharge them must be made after successful exploration, analysis of specific waters, and completion of development and production plans.

Response 29-22

The "guidelines to vessel and aircraft operators" from the Bering Sea regional biological opinion have been incorporated into an NTL that applies to all lease areas in the Bering Sea. The proposed NTL is currently in draft form.

Response 29-23

In a recent study of Unimak Pass (USCG, 1985), the U.S. Coast Guard came to the following conclusions:

(1) A traffic-separation scheme would not contribute significantly to navigation safety in Unimak Pass at this time.

(2) Compliance with the International Regulations for Preventing Collisions at Sea (72 COLREGS) is a sufficient, passive, and effective method of traffic management for the Unimak Pass area.

(3) The safety fairway recommended in 1981 will ensure that vessel traffic in the Unimak Pass area is not obstructed by fixed structures (U.S. CFR V50:52:10879). This conclusion is corroborated by Louis Berger and Associates, Inc. (1984). The 1972 Port and Waterway Safety Act and subsequent amendments mandate that the USCG conduct a similar study at least once every 8 years. If events changed significantly, this timeframe would be shortened accordingly.

Response 29-24

A map showing high, medium, and low industry interest is not appropriate for the evaluation of effects in this EIS. A major assumption that drives the analysis of effects in this EIS is that the mean-conditional resource (364 MMbbls) will be developed and produced. This resource estimate is based on an evaluation of the entire lease sale area. An early determination of areas of high, medium, and low industry interest is made to assist in selecting the area to be offered for leasing.

Response 29-25

This concern is addressed in Response 29-24.

30

Bristol Bay
Coastal Resource Service Area

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(907) 842-5257 – 842-5258

March 13, 1985

Thomas Boyd
EIS Coordinator
Minerals Management Service
P.O. Box 101159
Anchorage, Alaska 99510

RE: North Aleutian Basin Sale #92
DEIS Comments

Dear Mr. Boyd:

Following are the Bristol Bay Coastal Resource Service Area (CRSA) Board's comments on the draft environmental impact statement for North Aleutian Basin sale #92. The Bristol Bay CRSA Board is the legal entity responsible for developing and implementing a coastal management program for Bristol Bay; this program was approved February 6, 1985 by the Alaska Coastal Policy Council and is currently being reviewed for consistency with the federal CZMA by the Department of Commerce.

In order to allow for efficient review of this correspondence, it has been divided into three sections: biological impacts; oil spill impacts; and subsistence impacts.

__Biological Impacts__

30-1a The CRSA Board has been a participant in the sale #92 lease process from the beginning. In a May 23, 1983 letter responding to the Mineral Management Service's (MMS) Call For Information the CRSA Board stated a number of concerns. This letter emphasized the extreme productivity, and sensitivity, of the nearshore environment of the lease sale area. These areas include: Izembek and Nelson Lagoons, Herendeen Bay and Port Moller, the Seal Islands barrier islands and lagoon system, Port Heiden, and Ugashik and Egegik Bays. Many of the economically important fisheries resources of the region use these nearshore areas during one or more of their lifestages, particularly the critical juvenile stages. The CRSA Board requested that the MMS extensively research this nearshore zone during the DEIS assessment process.

__Biological Impacts__ (cont.)

In this same letter, the CRSA Board also voiced particular concern about the salmon which fuel Bristol Bay's world-renown salmon fishery, which in the last two years has had an average ex-vessel value (price paid to the fishermen) of 125 million dollars, with a high of 143 million dollars in 1983. A conservative estimate places the number of jobs involved in this fishery at 10,000 (these figures do not include the value and jobs from the Aleutian Island/Alaska Peninsula Management Area, portions of which are within the Bristol Bay CRSA jurisdiction). Due to the paramount importance the salmon fishery holds in the economic lives of the region's residents - as well as the subsistence value of the resource, which is difficult to quantify - the CRSA Board asked for a detailed assessment of the location and timing of the movements of salmon in the nearshore and offshore areas, both for the adult and juvenile lifestages.

30-1b The MMS did not provide this information in the DEIS. Specific omissions in regard to the nearshore environment are: the type and duration of potential oil spill impacts on the eelgrass beds that exist on the northern side of the Alaska Peninsula; and the effects of an oil spill on the benthic communities of the nearshore zone. Answers to these concerns are important due to the importance of the nearshore area as a primary producer for the commercial and subsistence resources used by Bristol Bay's residents.

The most important of these commercial and subsistence resources to the region's residents are salmon. Information not included in the DEIS that are important to impact assessment, and wise decision-making, include:

30-2 1) What are the seaward migration patterns of king, silver, pink and chum salmon?

30-3 2) To what degree do salmon stocks become mixed or concentrated in the nearshore water of Bristol Bay?

30-4 3) How long do juvenile salmon remain in the nearshore waters of outer Bristol Bay?

30-5 4) What ability do juvenile salmon have in detecting and avoiding oil-contaminated waters?

30-6 5) Will adult salmon migrate through oil contaminated waters?

These questions are couched in terms of Bristol Bay, yet it must be remsmbered that almost 90 percent of all western Alaska salmon stocks migrate through the North Aleutian Basin "portal" and thus, they are of statewide concern.

Although salmon are obviously the major economic and subsistence resource to the region's residents, the last decade has seen the emergence of a new fishery in the Bristol Bay region - herring. The Togiak herring fishery, the largest in Alaska, has increased dramatically over the last five years and had an ex-vessel value of 10.5 million dollars in 1983. As markets evolve and stabilize, new herring fisheries will undoubtedly emerge; in fact, several herring fisheries are scheduled for 1985 in the nearshore areas adjacent to lease sale #92. Two basic questione in regard to herring, and were not addressed in the DEIS, are:

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Biological Impacts (cont.)

30-7 1) The distribution and abundance of herring in the North Aleutian Basin area;

2) The effects of oil contamination on herring spawning substrates.

The lack of information on salmon and herring are of primary concern to the CRSA Board because of the economic importance of these species to the residents of the region.

30-8 Significant gaps in other fisheries resources also exist. Basic information on king crab, particularly given the population fluctuations that have occurred in the recent past, is lacking. Also, the distribution and abundance of capelin, important as a food source for species of economic importance, should be undertaken.

Oil Spill Impacts

30-9 The primary concern over the impact of sale #92 relates to the potential for an oil spill. The MMS spent a significant amount of time in the DEIS quantifying the potential for a spill, and the area that would be effected by either a minor (1,000 barrel) or major (100,000 barrel) spill. This analysis relied on two assumptions that should be called in to question: that a large spill would affect an area of only 200 km^2, and that the toxic effects of oil persist for at most 10 days following a spill. These are erroneous assumptions based upon the available scientific literature (Audunson, 1977; Teal and Howarth, 1984 - citations are included in an addendum to this letter). A 70,000 barrel spill (less than the worst-case 100,000 barrel) covered an area of approximately 4,000 km^2.

30-10 The low temperature of the water in the Bering Sea, along with a greater storm turbulence affect the toxicity of spilled oil. Low temperatures slow evaporation, which is important in the dilution of spilled oil. Storm turbulence would cause the oil to be dispersed in the water column, and this would also inhibit dilution of the spilled oil (Vandermeulen, 1982 and Howarth,1985).

Given this information, oil spill response becomes paramount. Oil spill response has not been demonstrated in the Bering Sea, which is appropriately referred to by the industry as a "frontier area". A major spill would require relocation of equipment from as far away as California, possibly taking two weeks. A recent transportation spill off of the Louisiana coast resulted in 55,000 barrels being dumped into the Gulf of Mexico. Compared to the conditions industry would confront in the Bering Sea, the clean-up of this spill should have been logistically simple; yet only one-tenth of one percent of the spilled oil was recovered!

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Subsistence Impacts

Section 810 of ANILCA (PL 96-487) requires the Secretary of Interior assess the potential for significant impacts on subsistence. The CRSA Board is of the opinion, given Gambell and Stebbins Vs Clark, that a section 810 evaluation is entirely appropriate. Unfortunately, the MMS evaluation and findings in regard to the Bristol Bay region are inadequate.

30-11 The section 810 review did not include a specific discussion on the villages of the Bristol Bay region that use the resources of the sale #92 area. All of the villages, with the possible exception of those on the Pacific Ocean side of the Alaska Peninsula, use the salmon of Bristol Bay. To a lesser extent, the marine mammals and waterfowl of the North Aleutian Basin are used for subsistence resources. Given the questions/information concerns posed in the preceding discussion on biological impacts, the CRSA Board questions how MMS can come up with a finding that the proposed action will not significantly reduce the populations of these harvestable resources.

Summary

Although beyond the question of the adequacy of the DEIS, the CRSA Board wishes to comment on national interest of oil and gas leasing in the North Aleutian Basin in view of the internationally-recognized resources of Bristol Bay. Unlike oil and gas (through the Outer Continental Shelf Lands Act, as amended), these unique physical and biological resources do not have a comprehensive mandate that states they are of national interest. The questions the CRSA Board poses are these: Is not the largest red salmon fishery in the world of national interest? Are not the largest congregation of marine mammals, and one of the greatest staging areas for waterfowl, in the world of national interest? Is not one of the greatest groundfish and shellfish harvest areas in the world of national interest? The CRSA Board feels that any one of these, and definitely the combination of all of them, warrant national interest consideration. The Board also believes that if this discussion were held outside of the very technical and lengthy OCS lease sale planning process, broad-based public opinion would support this conclusion.

In conclusion, the DEIS for the North Aleutian Basin contains the proposal, as well as three alternatives. The CRSA Board has rejected these four potential courses of action and recommends that the Secretary of Interior delay proposed sale #92 for at least ten years. This is in concurrence with the State of Alaska which, through its own planning process, has determined that the economic importance of the area's resources, and the lack of information on them, warrant a delay in oil and gas leasing in the North Aleutian Basin area.

Cordially,

Tim Hostetler

Tim Hostetler
Director
Bristol Bay CRSA Board

cc: Richard Miller
Kurt Fredriksson

TH/pr

Addendum

Audunson. T. 1977. The Bravo Blowout.
Field Observations, Results of Analyses and Calculations Regarding Oil on the Surface. Report of the Institue for Kontinental Sokkelundersokelser, Trondheim, Norway.

Howarth, R.W. 1985. The Potential Effects of Petroleum on the Living Resources. In: R. Backus, editor, An Atlas of Georges Bank, MIT Press, in press.

Teal, J.M., and R.W. Howarth. 1984. Oil Spill Studies: A Review of Ecological Effects. Environmental Management 8: 27-44.

Vandermeulen, J. 1982. What Levels of Oil Contamination May Be Expected in Water, Sediments, and What Would Be the Physiological Consequences for Biota? In: A. Longhurst, editor, Consultation on the Consequences of Offshore Oil Production on Offshore Fish Stocks and Fishing Operations. Canadian Technical Report of Fish and Aquatic Science, #1096, pg. 22-53.

Response 30-1a

The EIS discusses and analyzes the effects on all of the nearshore areas mentioned by the commentor. These discussions are included in Sections III.B.1. (Fisheries Resources), III.B.2. (Marine and Coastal Birds), III.B.3. (Pinnipeds and Sea Otters), III.B.4. (Endangered and Threatened Species), and III.B.5. (Nonendangered Ceteceans). The effects of oil and gas development on the resources that occupy these areas have been extensively discussed in Section IV.B. Most notable are the discussions of site-specific effects on the areas potentially affected in each subsection of Section IV.B. In addition, the specific nearshore areas adjacent to the planning area that are potentially at risk from oil spills have been identified in the Information to Lessees (ITL), on Areas of Special Biological Sensitivity (Sec. II.C.1.b.(2)). This ITL advises lessees to give these areas full consideration in developing their oil-spill-contingency plans.

Response 30-1b

A discussion of potential oil-spill effects on eelgrass has been added to the FEIS (Sec. IV.B.1.a.(1)), and the discussion of oil-spill effects on benthic organisms has been expanded (Sec. IV.B.1.a.(1)).

Response 30-2

This concern is addressed in Response 1-5.

Response 30-3

This concern is addressed in Response 1-5.

Response 30-4

This concern is addressed in Response 1-5.

Response 30-5

This concern is addressed in Response 1-5.

Response 30-6

This concern is addressed in Response 1-6.

Response 30-7

These concerns are addressed in Responses 1-8 and 1-9.

Response 30-8

Basic information on king crab is provided in Section III.B.1. This information includes a discussion of recent red king crab population fluctuations. Response 1-10 addresses the concern regarding capelin.

Response 30-9

These concerns are addressed in Responses 6-124 and 6-125.

Response 30-10

These concerns are addressed in Response 1-21 (oil-spill cleanup), and in Responses 6-124 and 6-125 (spill behavior and weathering in the subarctic).

Response 30-11

The Section 810 analysis (Sec. IV.K. of the EIS) represents an evaluation of the analysis performed in the EIS for the specific purpose of complying with ANILCA's subsistence-use requirements. The analysis examines possible effects throughout the entire Bristol Bay area. The Bristol Bay region, among other sites, is examined for factors potentially associated with leasing, exploration, and development of the lease sale area that could affect subsistence uses and needs, one of which is the potential to significantly reduce the populations of harvestable resources. The analysis is based on the best information available at the time. These available data are considered sufficient to perform an analysis from which to make a reasoned choice among alternatives.

(31)

United States Department of State

Washington, D.C. 20520

BUREAU OF OCEANS AND INTERNATIONAL
ENVIRONMENTAL AND SCIENTIFIC AFFAIRS

March 13, 1985

Regional Director
Alaska Region
Minerals Management Service
U.S. Department of the Interior
P.O. Box 101159
Anchorage, Alaska 98510

Dear Sir:

Several offices of the Department of State have reviewed the Draft EIS for proposed offshore oil and gas lease sale 92, North Aleutian Basin, and we have no comments on the document.

We appreciated the opportunity to review the draft EIS, and will look forward to receiving a copy of the final document when it is available.

Sincerely,

Paul J. Glasoe, Coordinator,
Environmental Impact Statements
Office of Food and Natural Resources

cc: Director,
Minerals Management Service
U.S. Department of the Interior
Reston, VA 22091

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U.S. Department of Transportation

United States Coast Guard

Commandant
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Washington, DC 20593
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16477.4b(0004)
12 Mar 85

Mr. William D. Bettenberg
Director, Minerals Management Service
U. S. Department of Interior
Reston, Virginia 22091

Dear Mr. Bettenberg:

We have reviewed the Draft Environmental Impact Statement for the proposed offshore oil and gas lease Sale 92, North Aleutian Basin. We have no comments to offer at this time.

We appreciate the opportunity to assist your efforts in the development of this documentation. We look forward to continued mutual cooperation and coordination of these projects.

Sincerely,

W. M. McGovern

W. M. McGOVERN
Chief, Environmental Compliance and Review Branch
Planning and Evaluation Staff
By direction of the Commandant

33

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

MAR 1 (1985

Regional Director
Minerals Management Service
U.S. Department of Interior
P. O. Box 101159
Anchorage, Alaska 98510

Dear Sir:

In response to the letter dated January 11, 1985, from William D. Bettenberg to the Nuclear Regulatory Commission, we have reviewed the Draft Environmental Impact Statement (EIS) prepared by the U.S. Department of Interior for the North Aleutian Basin Sale 92. Our review was directed to whether the action described in the draft EIS involved matters within our jurisdiction by law or special expertise or had any potential impact on NRC licensed facilities. No potential effects were identified; therefore, we have no specific comments on the draft EIS.

Thank you for the opportunity to review the draft document.

Sincerely,

James P. Knight, Acting Director
Division of Engineering
Office of Nuclear Reactor Regulation

cc: Director, Minerals Management Service (MS-644)
Reston, Virginia 22091

(34)

by Wilbur Mills in *Alaska, The Great Land*

Sierra Club
241 E. Fifth Avenue
Suite 205
Anchorage, Alaska 99501
(907) 276-4048

March 26, 1985

Mr. Thomas A. Boyd
Minerals Management Service
P. O. Box 101159
Anchorage, AK 99510

Dear Mr. Boyd:

The Sierra Club is pleased to offer the following comments on the Draft Environmental Impact Statement (DEIS) for the North Aleutian Basin Sale #92. Although the size of the sale area has been decreased from the original proposal, the areas still proposed for lease host the world's richest salmon fishery and contain the most biologically sensitive and critical migratory, staging, nesting, and feeding habitat for fish and wildlife. For example, the waters of Unimak Pass and the sensitive offshore waters of Izembek and Nelson Lagoon are proposed for leasing. Unimak Pass is the critical migration route for fish and marine mammals from the Pacific Ocean, including the endangered gray whale.

Because of the area's rich fish and wildlife resoruces, we urge the removal of Sale #92 from the federal offshore oil and gas lease sale schedule.

The fish and wildlife of Bristol Bay have been recognized as internationally important. This region of Alaska contains more federal and state conservation system units than any region of Alaska. Several state critical habitat areas are located on the north side of the Alaska Peninsula and eastward along the coast. Two state wildlife sanctuaries, five national wildlife refuges, one national park and one national monument are found in the Bristol Bay ecosystem. The public has long enjoyed the benefits of Bristol Bay's rich and pristine ecosystem.

The DEIS is inadequate in several specific areas which we shall
address. First, the risk analysis is flawed because it is based
on an assumption that the risk of an oil spill is uniform
throughout the United States outer continental shelf, i.e. Bristol
34-1 Bay is assumed to have the same risk as the Gulf of Mexico. This
is clearly not the case. The environmental conditions in Bristol
Bay are much more severe than the Gulf of Mexico. The Gulf of
Mexico does experience hurricanes, but does it experience sea ice,
very short days during the winter months, long distances from

basic onshore services such as oil spill clean-up capability, and seismic activity to name a few factors? The assumption of equivalent risk ignores severe environmental factors in Bristol Bay.

We question the assumed frequency of spill rates. The comparison
of spills onshore in Alaska to offshore accidents in the lower-48
outer continental shelf (OCS) is not a viable comparison. Just as
it is more difficult to operate onshore in the Alaskan arctic than
onshore in the lower-48, the complexities of offshore Alaskan OCS
development are even more difficult to surmount than operating in
34-2 the lower-48 OCS.

Please explain the justification for using statistics on spill rates from Prudhoe Bay to bolster the DEIS comparison to lower-48 spill rates. Severe sea storms and moving sea ice do not occur to the same degree onshore as offshore. It would seem a more appropriate comparison to use data from offshore development in a northern marine area such as the North Sea.

The DEIS claims most blowouts would be surface spills, yet the
probable exploration technology belies this assumption. For
example, the Bristol Bay Cooperative Plan indicates the most
likely technology for drilling offshore to be jack-up rigs, semi-
submersibles, or drilling ships. A blowout occuring with this
34-3 type of equipment would result in underwater contamination, not a
surface spill.

Please explain the assumption that oil spills in the worst case of
100,000 barrels would only affect a 200km2 area. How is this
justified given the high wind and sea conditions that frequently
occur in the area and the remote location of the drilling sites
34-4 resulting in a longer response time in the event of an accident?
Marine oil spills on the magnitude contemplated by the DEIS have
in actual instances affected far larger areas. The Argo Merchant
oil spill affected 14,000km2 after spilling under 165,000 barrels.
The spill was 65% larger than the DEIS's worst case analysis, yet
the area affected was 700% greater.

Onshore pipelines are a source of serious concern because of their
impact on the conservation system units along the Alaska Peninsula
and their potential disruption of the wildlife in the region. The
DEIS should contain a more thorough discussion of the onshore
impacts from terminal facilities, tanker ports, and pipelines.
34-5 The DEIS must expand its focus beyond exploration and development
offshore to include the onshore development of ports, support
facilities, and related activities. Because of impacts on the
diverse and valuable fish and wildlife of Bristol Bay, the entire
oil and gas scenario must be examined. Anything less is a
piecemeal analysis.

Discussion of seabird effects deserve greater coverage than a mere
footnote acknowledging major effects in the spring and fall. The
34-6 State of Alaska has recognized the potential for serious and

detrimental long-term effects of an oil spill in the near shore Alaska Peninsula areas by banning oil and gas exploration and development for ten years.

34-7 The discussion of sea bird impacts needs to be expanded and strong stipulations attached to any leases to prevent adverse impacts. Further, the impacts on birds is estimated at a low level assuming no spills will enter the lagoon habitat during spring and fall migrations. This assumption is specious because no seasonal restrictions are recommended during these migration periods. The DEIS states the probably of an oil spill reaching sensitive offshore areas such as Unimak Pass as 44%-99%.

"Information to Leasees" is totally inadequate protection. Such recommendations are easily ignored, may never be explained to employees onsite, and virtually unenforceable. The public interest in conserving Bristol Bay's fish and wildlife must be met through strong lease stipulations.

34-8 The Bristol Bay Cooperative Plan indicates that "Storm induced vertical mixing of spilled oil in shallow water, less than 60 meters deep could deliver oil to the bottom sediments in concentrations on the order of parts per thousand (OCSEAP, 1984). This may effect the food chain. Oil-contaminated bottom sediments may have a long-term impact. Research conducted in Buzzards Bay, Massachusetts, indicated that 8 years after an oil spill sediments contained hydrocarbon levels 12 times higher than normal (Anon, 1981). Cold sub-arctic environments as in the Bristol Bay area could require even more time for degradation of hydrocarbons from oil spills (ibid.)."

34-9 Following the Argo Merchant spill, dissolved oil remained above prior existing levels for at least five months. How does the persistence of oil in the environment after a spill affect the feeding of gray whales and other marine mammals? Biological information indicates that the north shore of the Alaska Peninsula is an important feeding area for endangered gray whales. The DEIS assumptions of persistence in the environment underestimates the length of time the oil will remain.

Thank you for this opportunity to comment.

Sincerely,

Sally Kabisch

Sally Kabisch
Associate Alaska Representative

<u>Response 34-1</u>

These concerns are addressed in Response 1-21 (oil-spill response in Bristol Bay); Response 1-48 (seismic risk); Responses 4-3 and 14-69 (Alaskan spill rates); and Responses 6-112, 6-113, 15-20, and 15-21 (risks in Bristol Bay versus elsewhere).

<u>Response 34-2</u>

This concern is addressed in Responses 4-3 and 6-112.

<u>Response 34-3</u>

Oil is lighter than seawater; in an undersea blowout, oil would rise to the surface and form a surface slick (see also Response 6-123). The category of platform spills also includes small surface spills from the platform itself. Such spills comprise the vast majority of platform spills.

<u>Response 34-4</u>

This concern is addressed in Response 6-124.

<u>Response 34-5</u>

The EIS has been amended to include a more comprehensive analysis of the onshore pipeline between Port Moller and Balboa Bay. The FEIS includes an analysis of the effects of an onshore pipeline, a marine terminal, and an LNG plant on fisheries resources (Sec. IV.B.1.a.(1)), subsistence-use patterns (Sec. IV.B.1.b.(4)), sociocultural systems (Sec. IV.B.1.b.(5)), water quality (Sec. IV.F.1.a.), air quality (Sec. IV.F.2.a.), cultural resources (Sec. IV.F.3.a.), transportation systems (Sec. IV.F.4.a.), land-use plans and coastal management (Sec's. IV.F.5.a.(1) and IV.F.5.b.(1)), and terrestrial mammals (Sec. IV.F.6.a.).

<u>Response 34-6</u>

The implications of the format used in Table S-1 are discussed in Response 6-1. Section IV.B.1.a.(2) contains a complete analysis of effects on marine and coastal birds.

<u>Response 34-7</u>

Summary Table S-1 summarizes potential widespread effects expected to result from activities associated with this sale. For completeness, the table also includes, in footnote form, effects expected to be more limited in terms of geographic extent, species groups affected, and/or season of occurrence. Readers desiring a more complete treatment of potential effects are referred to Section IV.B.1.a.(2) of the FEIS, wherein all important potential effects are discussed in some detail.

Several statements in Section IV.B.1.b.a.(2) have been amended. Although Stipulations and Information to Lessees (ITL's) are useful in addressing specific concerns expressed by various agencies and other groups, the OCS Orders, the review of the lessee's environmental reports and oil-spill-contingency plans, and the ascertainment of the lessee's compliance with the provisions of each are the principal means by which oil-spill effects would be prevented or mitigated.

Although the point is specifically made in the analysis that spill trajectories trend in the general direction of the Alaska Peninsula during the fall, the overall risk to lagoon inhabitants during the fall is expected to be low because the probability of a spill reaching the vicinity of a lagoon entrance (prerequisite for entry) is low (6%). Model spill trajectories suggest that spills would not move toward peninsula lagoons during the spring. Under the development scenario for the proposal, the probability of spills occurring and contacting the Unimak Pass area is 0 percent, not 44 to 99 percent (a value that reflects the chance of contact if a spill were to occur). The principal source of risk to Unimak Pass is projected tanker traffic from other U.S. OCS and Canadian sales. This risk is reflected in the cumulative probability of oil-spill occurrence and contact, which is 19 percent. The implication of this substantial probability is discussed in the cumulative analysis of Section IV.B.1.a.(2) (Marine and Coastal Birds). In offshore areas, bird densities are generally low, so spills are not likely to have significant effects on bird populations.

Response 34-8

It is extremely unlikely that wave turbulence would cause significant concentrations of oil in sediment at a 60-meter water depth--even during the severest storm. At 60 meters, wave energy is much lower than at the surface. Oil droplets dispersed into the water column are still lighter than water and try to return to the surface. Thus, even when oil is mixed into the water column, most oil accumulates near the water surface rather than at the bottom. To our knowledge, no significant accumulations of oil in sediments at water depths as great as 60 meters have ever been documented from storm-caused dispersion of an oil slick at sea.

The MMS has been unable to identify the commentor's OCSEAP (1984) citation. It is not in the bibliography of the Bristol Bay Cooperative Management Plan. The claim is inconsistent with conclusions and statements made in the two synthesis reports published by OCSEAP in 1984 (Jarvela, 1984; Thorsteinson, 1984). It is inconsistent with OCSEAP studies such as that by Payne (1984), who found that the oil adsorption capacity of sediments saturated at 0.12 to 1.2 parts per thousand. Manen and Pelto (1984) in Thorsteinson (1984) stated that the high energy of the North Aleutian Basin would limit residence time of sedimented oil to a maximum of 1 year.

In the 2 Buzzards Bay spills, some small quantities of oil may have been mechanically worked into the sediment by the grounded hulls. Most of the oil that got to the sediments first drifted into shore and became mixed with sediments either on the beach or in the surf zone. Eventually, some of the oiled sediments may have worked their way out into the nearshore, but with concentrations necessarily decreasing with distance seaward of the surf zone. This is the mechanism that could contaminate very-nearshore sediments in Bristol Bay if a spill first occurred and then reached the surf zone and/or shore.

Response 34-9

The amount of oil that will remain in the water column or disperse to the bottom is different, depending on the conditions accompanying a spill. In the Amoco Cadiz spill in 1978, 30 percent of the oil evaporated, 28 percent entered the intertidal zone, 13.5 percent mixed into the water column, 8 percent settled into the sediments, and 20.5 percent was unaccounted for. Oil in coarse-grained sediments was cleaned fairly rapidly, while fine-grained sediments showed elevated levels of hydrocarbons 3 years after the spill. However, by 1981, nearly all of the original invertebrate species began to recolonize the intertidal and subtidal zones. Note also that the North Aleutian Basin, because of its high energy, would be expected to cleanse itself more rapidly of sedimented oil than did the Amoco Cadiz sediments (Manen and Pelto, 1984).

The Norwegian Marine Pollution Research and Monitoring Program (FOH) investigated the ecological effect of oil in the enclosed waters of the narrow fjords at Lindas, near Bergen, and also in Halten Bank. From these FOH experiments, the principal conclusion was that oil concentrations of less than 100 micrograms of oil per liter parts per billion of seawater have no measurable effect on the ecosystem and that, at such levels, the behavior of the ecosystem is the same in oil-contaminated seawater as it is in uncontaminated seawater.

In addition, FOH research established that the flora and fauna in the tidal zone, where the bottom is hard, are not particularly vulnerable to oil pollution. According to the FOH, a major reason for this is the exposure to waves; where the area is exposed to waves, the oil disappears rapidly. In the worst possible case, the flora and fauna return to a normal state after about 2 or 3 years in areas exposed to waves, and after about 10 to 15 years in protected areas. In the case of a soft bottom beneath the tidal zone, researchers found that the ecosystem also was only slightly vulnerable to oil in comparison to the ecosystem in the open ocean.

A field experiment conducted in a moderate-energy environment (Kachemak Bay) indicated that, while 100 parts per million (ppm) of

Cook Inlet crude oil mixed into the benthic sediments were completely degraded after 1 year, 50,000 ppm were unchanged in quantity and composition. In the Amoco Cadiz spill, intertidal sediments near the spill site contained greater than 1,000 ppm shortly after the spill; but by March, the concentrations had decreased to 2 ppm. Due to the high energy of the North Aleutian Shelf benthic environment (as indicated by sand-grain sizes larger than 32 micrometers), it is hypothesized that the maximum resident time of oil in the sediment in this area would be 1 year, based on data gathered from the Amoco Cadiz spill. The synthesis report for the St. George Basin (1982) came to the following conclusion for a 50,000-barrel oil spill that would occur near the Alaska Peninsula: concentrations of dissolved oil greater than 20 parts per billion would exist in an area between 100 to 300 km^2 in the bottom and upper mixed-water layers after about 10 days. The exact effects of dissolved oil on feeding gray whales are unknown; but the majority of the gray whale population passes through or near natural oil seeps off California with no evidence of acute reactions (chronic reactions are difficult to measure.)

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DEPARTMENT OF THE NAVY
OFFICE OF THE ASSISTANT SECRETARY
(SHIPBUILDING AND LOGISTICS)
WASHINGTON, D.C. 20360

1 APR 1985

Mr. Alan D. Powers
Regional Director, Alaska Region
Minerals Management Service
P. O. Box 101159
Anchorage, Alaska 98510

Dear Mr. Powers:

The Draft Environmental Impact Statement (DEIS) for the Alaska North Aleutian Basin Sale 92 has been reviewed and is correct with regard to Department of Defense operations. At this time, there are no significant military activities conducted in the proposed area that would conflict with oil and gas development.

Sincerely,

F. S. STERNS
Director
Installations and Facilities

cc:
Director, Minerals Management Service
Mail Stop 644
Reston, VA 22091

Deputy Director
Environmental Policy, ODASD(I)
Room 3D833, Pentagon

VI.

CONSULTATION AND COORDINATION

VI. CONSULTATION AND COORDINATION

A. Development of the Proposal

The North Aleutian Basin (Sale 92) is only one of the proposed offshore lease sales included in the Final 5-Year Oil and Gas Lease Sale Schedule. Official coordination with other government agencies, industry, and the public regarding this proposal began in September 1982. At that time, the MMS requested resource reports from all federal agencies with expertise pertinent to the proposed leasing area. On April 29, 1983, a Call for Information was published in the Federal Register to request (1) expressions of industry interest in blocks within the Call area and (2) comments on environmental issues related to possible oil and gas leasing in the area. Eleven comments were received in response to the Call.

In August 1983, the Department of the Interior announced the selection of the entire North Aleutian Basin Planning Area for environmental analysis and study in the EIS (13.1 million hectares or 32.5 million acres). However, as a result of the Secretary's consultation with the Governor of Alaska, the area to be studied was reduced to approximately 2.27 million hectares (5.6 million acres) consisting of 990 blocks (Graphic 1). This area, which represents approximately 17 percent of the North Aleutian Basin Planning Area, is analyzed in this EIS.

B. Development of the Environmental Impact Statement

During preparation of this EIS, federal, state, and local government agencies; industry; special-interest groups; and the public were consulted to obtain descriptive information, to identify significant potential effects and issues, and to identify effective mitigating measures and reasonable alternatives to the proposal. The information received was used in preparing this EIS. Section I.E. of this EIS discusses the scoping process for this proposed lease sale. The following section (Sec. VI.C.) lists organizations and individuals contacted by the MMS prior to and during the preparation of this EIS.

Departmental Manual Section No. 655 details procedures for intradepartmental coordination regarding offshore oil and gas leasing. In accordance with these procedures, Department of the Interior agencies with interest and expertise in federal offshore leasing were consulted during the development of the potential lease stipulations for this lease sale (see Sec. II.C.1.b., Mitigating Measures).

C. List of Contacts for Preparation and Review of the Draft Environmental Impact Statement

A special coordination effort has been conducted by MMS with the State of Alaska and the United Fishermen of Alaska on behalf of the Bering Sea commercial fishing community. The purpose of the special coordination effort was twofold:

- To provide a direct opportunity for the state and the Bering Sea commercial fishing community to identify major concerns and issues to ensure that they are well covered in the EIS for the North Aleutian Basin (Sale 92), as well as in other MMS decision documents.

- To share the MMS studies information pertaining to fisheries resources of the Sale 92 area, to determine whether additional information should be obtained.

The following meetings (with respective agenda items) were held with the State of Alaska and the United Fishermen of Alaska (UFA):

- August 8, 1984: (a) Purpose of special coordination effort for Sale 92; (b) schedule for Sale 92; (c) studies information pertaining to fisheries resources of the Sale 92 area; and (d) future meetings.

- August 16, 1984: (a) Issues to be addressed in Sale 92 EIS; (b) fisheries-related studies for the North Aleutian Basin lease sale area; and (c) staff paper to address additional fisheries information pertaining to Sale 92.

- August 25, 1984: (a) Sale 92 oil-spill-risk analysis.

- November 6, 1984: (a) Scope of coordination effort regarding Sale 92; (b) fisheries staff paper outline; (c) timetable for completion of staff paper; (d) review, coordination, and distribution of staff paper; (e) coordination with Bering Sea commercial fishing groups; and (f) identification by the state and the UFA of fisheries information to be addressed in the staff paper.

- April 15, 1985: (a) Timeframe for completion of fisheries staff paper and final EIS; (b) resource estimates for Sale 92 area; and (c) UFA comments on staff paper.

In accordance with 40 CFR 1502.21, this final EIS incorporates by reference the document entitled "Summary of Fisheries Information-North Aleutian Basin" which resulted from this special coordination effort. That document describes available information and environmental studies concerning fisheries in the North Aleutian Basin and Bering Sea, with particular emphasis on red king crab, salmon, herring, capelin, Pacific sand lance, and bottomfish. The information and studies referred to in that document were considered by MMS in preparing the final EIS.

Federal, state, and local government agencies; academic institutions; industry; special-interest groups; and private citizens were consulted prior to and during the preparation of this EIS. Agencies, groups, and individuals contacted for information during preparation of the EIS are listed below.

Federal Agencies

Department of Agriculture
- Forest Service

Department of Commerce
- National Marine Fisheries Service
- National Marine Mammals Laboratory
- National Oceanic and Atmospheric Administration
- OCSEAP Office, Juneau
- Office of Coastal Zone Management
- Office of Ecology and Environmental Conservation

Department of Defense
- Air Force
- Army Corps of Engineers
- Department of the Army
- Naval Operations

Department of Energy
- Alaska Field Office
- Economic Regulatory Administration
- Federal Energy Regulatory Commission
- Leasing Policy Development
- Office of Environmental Conservation
- Technical Information Center

Department of the Interior
- Bureau of Indian Affairs
- Bureau of Land Management
- Bureau of Mines
- Fish and Wildlife Service
- Geological Survey
- National Park Service
- Office of Aircraft Services

Department of State
- Office of Environmental and Health

Department of Transportation
- Coast Guard

Department of the Treasury

Environmental Protection Agency

Marine Mammal Commission

Material Transportation Bureau
- Office of Pipeline Safety Operation

Nuclear Regulatory Commission

U.S. House of Representatives
- Committee on Merchant Marine and Fisheries

U.S. Senate
- Committee on Energy and Natural Resources

<u>State of Alaska</u>

The Honorable William Sheffield, Governor
Department of Administration
Department of Commerce and Economic Development
Department of Community and Regional Affairs
Department of Environmental Conservation
Department of Fish and Game
Department of Health and Social Services
Department of Labor
Department of Law
Department of Natural Resources
Department of Public Works
Department of Revenue
Department of Transportation and Public Facilities
Office of Coastal Management
Office of the Governor
Office of Governmental Coordination

Universities

University of Alaska

Institute of Marine Science

Marine Advisory Program

Museum

University of California

Native Organizations

Aleut Corporation

Aleutian/Pribilof Islands Association, Inc.

Bering Strait Native Coporation

Bristol Bay Native Association

Ounalashka Corporation

Tanadgusix Corporation

Tanaq Corporation

Special-Interest Groups

Acoustical Society of America

Alaska Center for the Environment

Alaska Conservation Society

Alaska Geological Society, Inc.

Alaska League of Women Voters

Alaska Miners Association

Alaska Oil and Gas Association

Alaska Professional Hunters Association

Alaska Public Interest Research Group

Alaska Wildlife Federation and Sportsman's Council, Inc.

ARCO Alaska, Inc.

Audubon Society, Anchorage Chapter and National Representative

Bering Sea Fisherman's Association

Chevron USA, Inc.

Chugach Gem and Mineral Society

Friends of Animals

Friends of the Earth

Geophysical Society of Alaska

Greenpeace Alaska

Moening-Grey and Associates, Inc.

Natural Resources Defense Council, Inc.

North Pacific Fishery Management Council

North Pacific Fishing Vessel Owners Association

Pan Alaska Fisheries

Resource Development Council

Sierra Club

Sohio Alaska Petroleum Company

Trans Pacific Seafood

Trustees for Alaska

United Fishermen of Alaska

Wilderness Society

Additional Contacts

Abby Arnold, Aleutians East CRSA

Canadian Wildlife Service

College of the Atlantic

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BIBLIOGRAPHY

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ACRONYM

GLOSSARY

Acronym Glossary

AAC	Alaska Administrative Code
ABSORB	Alaskan Beaufort Sea Oilspill Response Body
ACMA	Alaska Coastal Management Act
ACMP	Alaska Coastal Management Program
ACORP	Alaska Cooperative Response Planning Committee
ACS	Alaska Clean Seas
ADF&G	Alaska Department of Fish and Game
AEIDC	Arctic Environmental Information and Data Center
ANCSA	Alaska Native Claims Settlement Act
ANILCA	Alaska National Interest Lands Conservation Act
AOGA	Alaska Oil and Gas Association
API	American Petroleum Institute
APD	Application for Permit to Drill
ARCO	Atlantic Richfield Company
AMSA	Area Meriting Special Attention
ATV	all-terrain vehicle
AVCP	Association of Village Council Presidents, Inc.
Bbbls	billion barrels
BBCMP	Bristol Bay Cooperative Management Plan
BBRMP	Bristol Bay Regional Management Plan
BTF	Biological Task Force
BLM	Bureau of Land Management
C	celsius
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CMP	Coastal Management Program
COE	Corps of Engineers
COST	Continental Offshore Stratigraphic Test
CPA	Cost Participating Area
CPC	Coastal Policy Council
CRSA	Coastal Resource Service Area
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
dB	decibels
DEC	Department of Environmental Conservation
DEIS	draft environmental impact statement
DO	dissolved oxygen
DOE	Department of Energy
DOTPF	Department of Transportation and Public Facilities (State of Alaska)
DST	Deep Stratigraphic Test
DWT	Dead Weight Tons
EIS	environmental impact statement
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FEIS	final environmental impact statement
FO	Field Operations
FR	Federal Register

Acronym Glossary
(Continued)

ft	foot
FWS	Fish and Wildlife Service
FY	fiscal year
gpm	gallons per minute
Hz	Hertz
INPFC	International North Pacific Fisheries Commission
ISER	Institute of Social and Economic Research
ITL	Information to Lessees
Kw	kilowatt
km	kilometers
lbs	pounds
LC_{50}	Lethal Concentration at which 50 percent of individuals survive
LNG	liquified natural gas
LE	Leasing and Environment Office
m	meter
mi	mile
MGD	Million Gallons per Day
MLLW	Mean Lower Low Water
MMbbls	million barrels
MMC	Marine Mammal Commission
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
NARL	Naval Arctic Research Laboratory
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollution Discharge Elimination System
NPFMC	North Pacific Fisheries Management Council
NRDC	Natural Resources Defense Council
NTL	Notice to Lessees
NWR	National Wildlife Refuge
OCP	oil-spill-contingency plan
OCS	outer continental shelf
OCSEAP	Outer Continental Shelf Environmental Assessment Program
OCSLA	OCS Lands Act
ODAL	Omindirectional Approach Lights
OSC	on-scene coordinator
OSRA	oil-spill-risk analysis
ppb	parts per billion
ppm	parts per million
PSD	prevention of significant deterioration
REAA	regional education attendance area
RRT	Regional Response Team
RS	Regional Supervisor

Acronym Glossary
(Continued)

RSFO	Regional Supervisor, Field Operations
RTWG	Regional Technical Working Group
RU	research unit
SESP	Social and Economic Studies Program
SID	secretarial issue document
SSC	Scientific Support Coordinator
tcf	trillion cubic feet
TINRO	Trudy Instituta Okeānologia
TLM	Toxic Lethal Median
USCG	U.S. Coast Guard
USDOI	U.S. Department of the Interior
USGS	U.S. Geological Survey
VFR	visual flight rules
VLCC	very large crude carrier (tanker)
WSF	water-soluble fractions

APPENDICES

APPENDIX A

Exploration and Development Scenario

Maximum Case

North Aleutian Basin (Sale 92)

Prepared by

Minerals Management Service

Maximum Case
North Aleutian Basin (Sale 92)

A. Description and Resource Estimates: The hypothetical development strategy for the maximum case is based on a resource level of 759 MMbbls of oil and 5.250 TCF of gas (Table A-1). The resource estimates and the analysis of the maximum case are based on the following major assumptions.

- Increasing projected oil resources would be expected to double the number of oil spills (2 1,000-barrel-or-greater spills and 0.08 100,000-barrel-or-greater spills).

- Gas production from two offshore platforms would be transported by pipeline across the Port Moller/Balboa Bay transportation corridor to an LNG plant at Balboa Bay.

- Oil production from three offshore platforms would be transported by pipeline to the transshipment terminal at Balboa Bay via a pipeline across the proposed Port Moller/Balboa Bay transpeninsula transportation corridor (BBRMP, 1985).

- Hydrocarbons would be transported from the Balboa Bay transshipment terminal to markets by VLCC-type tankers.

- Marine support for offshore operations would be based out of Unalaska. Cold Bay could serve as the primary air-support site.

B. Developmental Timetable: The exploration period is expected to begin in 1986 and to end in 1993 (Table A-1). Eight exploration and twelve delineation wells are expected to be drilled. If commercial quantities of hydrocarbons are located during the exploration phase, planning and construction of the first oil platform would start around 1987. During this period, 76 production and service wells would be drilled from five platforms. Pipeline construction could begin in 1994 and end in 1997. Total pipeline mileage would vary according to the location of the production platforms; however, about 480 kilometers of oil and gas pipeline are anticipated. The pipeline would connect production wells to a transshipment terminal on Balboa Bay via the proposed Port Moller/Balboa Bay transpeninsula transportation corridor. The transshipment terminal should be completed in 1995.

Oil production is expected to begin in 1996, with a peak annual production of 64 MMbbls between 1997 and 2002. The volume of recoverable oil is expected to gradually decline after 2002, with oil output ceasing in the year 2015. Gas production is expected to begin in 1998, with a peak annual production of .252 TCF of gas between 1999 and 2016. The volume of recoverable gas is expected to decline after 2016, with output ceasing in the year 2021.

The level of preliminary seismic activity would depend on the number of exploratory and delineation wells drilled and the number of production platforms installed from which production wells would be drilled. These surveys would use high-resolution instruments to evaluate shallow geologic hazards for drilling clearance. This appendix uses the maximum-case resource estimate to

Table A-1
Estimated Schedule of Development and Production
Maximum Case

YEAR	EXPLORATION WELLS	DELINEATION WELLS		PLATFORMS		PRODUCTION AND SERVICE WELLS		TRUNK PIPELINE (kilometers)		PRODUCTION	
		Oil	Gas	Oil	Gas	Oil	Gas	Oil	Gas	Oil (MMbbls)	Gas (TCF)
1985											
1986	1										
1987	1										
1988	1	2									
1989	1	1									
1990	1	2		1		4					
1991	1	1	1			12					
1992	1	2	1	1		4					
1993	1	1	1			13					
1994				1		4		160			
1995					1	13	4	80			
1996					1		12		160	19	
1997							10		80	64	
1998										64	.200
1999										64	.252
2000										64	.252
2001										64	.252
2002										64	.252
2003										56	.252
2004										49	.252
2005										43	.252
2006										36	.252
2007										31	.252
2008										28	.252
2009										24	.252
2010										22	.252
2011										20	.252
2012										17	.252
2013										16	.252
2014										14	.252
2015											.252
2016											.252
2017											.205
2018											.152
2019											.100
2020											.057
2021											
2022											
2023											
2024											
2025											
2026											
TOTALS	8	9	3	3	2	50	26	240	240	759	5.250

Source: USDOI, MMS, Revision of Exploration and Development Report for Sale 92, 1984.

predict levels of drilling activity. That estimate also is used to predict levels of preliminary seismic activity: (1) a total of 20 exploratory and delineation wells, and (2) a total of 76 production and service wells would be drilled from five production platforms. Preliminary seismic activity for site-clearance work would occur at 25 sites. Since several production wells would be drilled from the same platform, each production well would not require separate seismic surveys. Therefore, the total number of surveys required would probably be fewer than 25 for a maximum-resource level.

The lessee has the option of running a site-specific survey, which involves 39 trackline miles of data, or a block-wide survey, which involves 188 trackline miles of data (see Alaska OCS Order NTL 83-5 for survey details). Most surveys probably would be site-specific due to cost considerations, but for the estimates made here, it is assumed that half of the surveys would be block-wide and half would be site-specific. Therefore, the estimate of total activity may be somewhat high. For the 25 sites, a total of 2,913 trackline miles are estimated to be surveyed. The actual level of activity may vary from this estimate for the following reasons: (1) the amount of recoverable petroleum may differ from the maximum-case resource estimate; (2) the proportion of site-specific surveys to the more extensive block-wide surveys may differ from the 50/50 assumption made here; (3) fewer than 25 site surveys may be required due to production platforms being sited on abandoned exploratory well sites that have already been surveyed; (4) and more than 25 site surveys may be performed if site-clearance work is done on lease blocks that are never drilled.

Exploration and production well-derived solids (muds and cuttings) resulting from the maximum-case scenario would be approximately 2.3 times greater than those derived in the mean case. Between about 113,000 and 138,000 tons of cuttings and about 3,091 tons of muds would be derived between 1986 and 1997.

C. Infrastructure Associated with Exploration, Development, and Production: Exploration, development, and production infrastructure would generally be the same as described for the mean case (proposal). Also, the size and scope of the support facilities could be greater than for the proposal because of the higher resource estimates.

D. Environmental Consequences:

1. Effects on Biological Resources:

a. Effects on Fisheries Resources: Overall effects on fisheries resources due to seismic activity, oil spills, natural gas releases, and discharges of drilling fluids, cuttings, and formation waters associated with the maximum-case scenario would be greater than those described for the mean case (proposal). Because the maximum case assumes resource levels of 759 MMbbls of oil and 5.250 TCF of gas, both of which are approximately double the resource levels estimated for the mean case, a substantial increase in spill-contact probabilities would be expected for areas used by concentrations of the more susceptible lifestages (i.e., nearshore egg, larvae, and juveniles) of fisheries resources. For example, the probability of a 1,000-barrel-or-greater spill occurring and contacting the Port Moller/Nelson Lagoon area would be expected to increase from 24 percent (mean case) to 44 percent. Drilling and production discharges would increase; consequently, localized lethal and sublethal concentrations, which could affect a portion of one or more regional fisheries populations, could increase. The overall effects of these increases in drilling and production discharges, seismic activities, natural gas releases, and oil spills are not expected to exceed moderate for salmonids, forage fish, groundfish, or other invertebrates, as compared to the minor overall effects that are expected for the mean case. Effects on red king crab are expected to be major.

b. Effects on Marine and Coastal Birds: Increasing projected oil resources from 364 to 759 MMbbls would approximately double the expected number of oil spills (1,000 bbls = 2 spills; 100,000 bbls = 0.08 spills) which potentially could be associated with this lease sale. The probability of 1 or more 1,000-barrel-or-greater spills occurring is 86 percent (mean case=61%), while for 100,000-barrel-or-greater spills, the probability is 6 percent (mean case=3%).

Such an increase would be reflected in greater risk to bird populations, especially where they are concentrated at certain seasons. For example, the probability of a 1,000-barrel-or-greater spill occurring and contacting the Port Moller/Nelson Lagoon Biological Resource Area (7) would be expected to increase from 19 percent (mean case) to 36 percent (maximum case). A corresponding increase in the number of spills expected (from 0.21 to 0.44) indicates that there is a substantial probability of a spill entering this area. The probability of oil entering Nelson Lagoon during the critical fall-migration period, when many oil-spill trajectories trend toward the peninsula, could be elevated considerably once a spill enters the nearshore zone. The probability of spill occurrence and contact with the land segment representing the entrance to Nelson Lagoon increases from 5 percent (mean case) to 12 percent (maximum case).

These values suggest that a substantial increase in oil resources could increase considerably the risk of major effects from oil spills in several areas where marine and coastal birds are concentrated. Most importantly, the potential exists for major adverse effects in lagoons along the northern coast of the Alaska Peninsula, where large numbers of waterfowl and shorebirds concentrate during spring- and fall-migration periods, and areas surrounding large seabird nesting colonies in the Shumagin Islands south of the Alaska Peninsula. The risk of moderate effects would increase most importantly in the general area of the Shumagin Islands and adjacent waters of the Alaska Peninsula (nesting seabirds), and in coastal waters including the 50-meter depth contour, especially north of the peninsula, where large numbers of shearwaters concentrate. Elsewhere, and in other seasons, effects are expected to be minor.

A substantial increase in disturbance during spring- and fall-migration periods could result from increased numbers of air-service flights (10 per day to 5 platforms; mean case=4 per day to 2 platforms) in the vicinity of Izembek and Nelson Lagoons. At Izembek, in particular, adjacent to the Cold Bay air-staging facilities, brant and perhaps other waterfowl species could experience major disturbance effects. Elsewhere, disturbance effects are expected to remain as described in Section IV.B.1.a.(2).

c. Effects on Pinnipeds and Sea Otters: The overall effects of the proposal on pinnipeds and sea otters are likely to be somewhat greater than those described for the proposal. A twofold increase in petroleum resources would increase the projected number of oil spills of 1,000 barrels or greater to about 2 spills, versus 1 spill under the mean case, and would substantially elevate spill-contact probabilities for sea otter, sea lion, harbor seal, and fur seal habitats within or adjacent to the lease sale area. The increased tanker traffic out of Balboa Bay would greatly increase the risk of oil effects on local sea otter populations in the Shumagin Islands and would increase spill risks to migrating fur seals near the southern shore of the Alaska Peninsula. Spill risks to marine mammal coastal habitats on the northern coast of the Alaska Peninsula also would increase. As a result, the level of oil-spill effects on fur seals may increase to moderate, while oil-spill effects on sea otters also would increase but are still not likely to exceed moderate. Oil- spill risks to sea otter habitats other than the Port Moller area are very low for the mean case. Oil-spill effects on sea lions and harbor seals probably would remain minor, as under the mean case. Increased localized changes in harbor seal and sea lion distributions at rookeries and/or haulout areas may occur as a result of increased disturbance associated with higher levels of industry activity. However, the level of noise and disturbance effects on the regional pinniped and sea otter populations of the North Aleutian Basin lease sale area is likely to remain minor, even in the maximum case. Potential oil-spill effects on fur seals may increase to moderate under the maximum oil-resource case, while the level of oil-spill effects on other pinnipeds and sea otters is likely to be the same as under the mean case. Noise and disturbance effects are likely to remain minor, as under the proposal.

d. Effects on Endangered and Threatened Species: Overall effects on endangered and threatened species, due to direct and indirect effects of oil spills and disturbances associated with development and transport of extracted oil, would be greater than those described for the mean case, although the logistic and product-transportation patterns would be the same as for the mean case. Since the maximum case assumes a level of petroleum resources about two times greater than that estimated for the mean case, an increase in oil-spill-contact probabilities would be expected. Increased noise and disturbances associated with higher levels of development would be expected in the maximum case and could result in localized changes in distribution and numbers of potentially sensitive endangered species. Effects on migrating whales (especially gray and humpback whales) are not expected to exceed moderate. Effects on species not as common (blue, sei, sperm, and bowhead) in the lease sale area are not expected to exceed moderate.

e. Effects on Nonendangered Cetaceans: Overall effects on nonendangered cetaceans because of direct and indirect effects of oil spills and disturbances associated with development and transport of extracted oil, would be greater than those described for the mean case, although the logistic and product-transportation patterns would be the same as for the mean case. Since the maximum case assumes a level of petroleum resources about three times greater than that estimated for the mean case, an increase in oil-spill-contact probabilities would be expected. Increased noise and disturbances associated with higher levels of development would be expected in the maximum case and could result in localized changes in distribution and numbers of potentially sensitive nonendangered cetaceans. Effects on all 10 species of migrating cetaceans possibly are not expected to exceed moderate. Effects on all those species that are not as common (see Sec. IV.B.1.a.(5)) in the lease sale area are not expected to exceed minor.

2. Effects on Social and Economic Systems:

a. Effects on Commercial Fishing Industry: Development of maximum-case resources could produce effects greater than those discussed in the proposal. Space-use conflicts would be greater for longer oil and gas pipelines (a total of 480 km instead of 420 km of parallel pipe), the increased number of development platforms, and the longer time period of development (five platforms in place between 1994 and 2020 instead of two between 1990 and 1993). This could cause a maximum projected catch loss of 3 percent of annual catch rather than 2 percent, which could increase economic loss to fishermen. However, effects of space/catch loss on commercial fisheries are still expected to be minor.

In the maximum case, the level of exploration and supply-vessel traffic could be twice as great as for the proposal (mean case) because there would be 20 exploration and delineation wells rather than 10, and more than double the number of platforms (five instead of two) during the development phase.

Also, the development phase would be longer--7 years instead of 3 years. Therefore, the potential for interaction with fixed fishing gear could be twice as great and could occur over a much longer period. During the development phase, interference with crab pots could cause major effects on crab fisheries in the maximum case.

Because more oil industry vessels would be in the area with the maximum case, longline-gear loss may increase to minor even though, in most cases, vessels should be able to successfully avoid contacting and thus damaging buoy poles. Damage or loss of trawl gear from the increase in bottom obstruction and debris would be greater than for the proposal, but would remain at less than one incident per year.

The production of over twice as much oil in the maximum case (759 MMbbls compared to 364 MMbbls in the proposal) would increase oil-spill risks and thus the risk of damaging gear and causing lost fishing time and income. Overall effects are still expected to be minor for all fisheries, except for the red king crab fishery, where effects are expected to be major.

b. Effects on Local Economy: Total employment effects would peak at nearly 1.5 times the peak employment of the mean case, and total employment during the production phase would be 73 percent greater than production-phase employment for the mean case. However, the larger number of jobs created by the maximum case would be irrelevant to future levels of joblessness in the region, because current unemployment and projected unemployment in the absence of the proposed sale are negligible in the communities that would be affected by the lease sale. The maximum case would be slightly more likely than the mean case to cause port congestion, housing shortages, or increased rates of price inflation in Unalaska. The overall economic effects of the maximum case would be minor.

c. Effects on Community Infrastructure: The effects on Cold Bay's community infrastructure from population increases resulting from support-facility activity would be very similar to that of the proposal. In the maximum case, OCS-generated demands could increase about 1.5 times over those of the proposal. The increased demands would pose no problems other than those identified for the proposal and, with the exception of the water-supply and sewage-treatment systems, the total demand would be within the capabilities of the existing systems. The sewage-treatment and water-supply systems, which are currently overutilized, would require upgrading in the near future to meet minimum standards. Although OCS-generated use would increase the demand on these systems, it is expected that new facilities would be on-line before the bulk of OCS-related demand occurred in the production phase. These OCS activities would have a negligible effect on Cold Bay's infrastructure.

The effects on Unalaska's infrastructure would be similar to those identified in the proposal, although OCS-generated demands on basic services would increase about 1.5 times over those of the proposal. The OCS demands could be accommodated by the additional facilities necessary to meet base-case needs and generally would have a negligible effect on Unalaska's basic services.

d. Effects on Subsistence-Use Patterns: The maximum case encompasses a considerably greater level of resource potential than the proposal and, therefore, would increase the size of the labor force, the magnitude of offshore activities, and the potential for oil-spill incidents. Using the same basic scenario as used for the proposal, the effects on subsistence-use patterns at Unalaska and Cold Bay could increase somewhat over the levels established for the proposal, but not to any great extent. This is based on the limited extent of subsistence practices carried on at Cold Bay and the marginality of OCS-related effects at Unalaska compared to the effects associated with development of the groundfish industry. On the lower Alaska Peninsula, direct effects on subsistence resources from oil-spill incidents could be increased due to increased resource and activity levels and to the use of the Balboa Bay transshipment terminal site. Here, as elsewhere in Bristol Bay, however, subsistence-use patterns are likely to be affected more by the indirect economic effects of changes in the commercial-salmon-fishing industry than by direct effects on local subsistence resources. As explored in the case of the proposal, such potential effects would be more likely to occur in the maximum case. The effects on subsistence-use patterns as a result of the maximum case would be expected to be negligible.

e. Effects on Sociocultural Systems: The relatively larger resource potential of the maximum case is the basis for a considerably greater labor force and level of potential activity within the lease sale area and at support-base locations. These support-base locations are the same as those designated in the analysis of the proposal, namely Unalaska and Cold Bay. Here, the potential effects on sociocultural systems could increase somewhat over the relatively inconsequential levels established for the proposal, but not to any appreciable extent.

This also should be the case for the Bristol Bay region as a whole, although an increased potential for risk to the commercial salmon fishery should result from the increased level of activity in the maximum case. The increased tankering activities and their proximity to the communities of the lower Alaska Peninsula subregion could increase potential effects on sociocultural systems of the subregion as a whole, and especially on Sand Point, where the population could increase as a result of terminal operations and increased tankering could increase the risk on marine resources, which are the basis of the local subsistence lifestyle. The effects of the maximum case on the sociocultural systems of Unalaska, Cold Bay, and the Bristol Bay region are anticipated to be negligible. The effects on the Alaska Peninsula and Sand Point are anticipated to be minor and moderate, respectively.

APPENDIX B

Exploration and Development Scenario

Minimum Case

North Aleutian Basin (Sale 92)

Prepared by

Minerals Management Service

Minimum Case
North Aleutian Basin (Sale 92)

A. Description and Resource Estimates: The hypothetical development strategy for the minimum case is based on a resource level of 83 MMbbls of oil (Table B-1). The resource estimates and the analysis of the minimum case are based on the following major assumptions.

- Decreasing the projected oil resources from the mean case of 364 to 83 MMbbls would reduce the expected number of oil spills (0.22 1,000-barrel-or-greater and 0.005 100,000-barrel-or-greater spills).

- The development of gas resources is not included in the analysis of the minimum case. Current market prices and the high cost of liquefaction and transportation make development of gas resources uneconomic (Dames and Moore, 1982; USDOI, MMS, 1983).

- Hydrocarbons from offshore production platforms would be transported directly to markets by tankers.

- Marine support for offshore operations would be based out of Unalaska. Cold Bay could serve as the primary air-support site.

B. Development Timetable: The exploration period is expected to begin in 1986 and to end in 1990 (Table B-1). Five exploration wells and three delineation wells are expected to be drilled from one rig. If commercial quantities of hydrocarbons are located during the exploration phase, planning and construction of the platform would start around 1987. One production platform may drill 6 production and service wells (Table B-1). Production is expected to begin in 1993, with a peak annual production of 7 MMbbls occurring between 1994 and 1999. Production is expected to cease by the year 2012.

The level of preliminary seismic activity would depend on the number of exploratory and delineation wells drilled and the number of production platforms installed from which production wells would be drilled. These surveys would use high-resolution instruments to evaluate shallow geologic hazards for drilling clearance. This appendix uses the minimum-case resource estimate to predict levels of drilling activity. That estimate also is used to predict levels of preliminary seismic activity: (1) a total of eight exploratory and delineation wells, and (2) a total of six production and service wells would be drilled from one production platform. Preliminary seismic activity for site-clearance work would occur at nine sites. Since several production wells would be drilled from the same platform, each production well would not require separate seismic surveys. Therefore, the total number of surveys required probably would be fewer than the nine projected for the minimum-resource-case level.

The lessee has the option of running a site-specific survey, which involves 39 trackline miles of data, or a block-wide survey, which involves 188 trackline miles of data (see Alaska OCS Order NTL 83-5 for survey details). Most surveys probably would be site-specific due to cost considerations; but for the estimates made here, it is assumed that half of the surveys would be block-wide and half would be site-specific. Therefore, the estimate of total activity may be somewhat high. For the nine sites, a total of 1,362 trackline

Table B-1

Estimated Schedule of Development and Production
Minimum Case

YEAR	EXPLORATION WELLS Oil	DELINEATION WELLS Oil	PLATFORMS	PRODUCTION AND SERVICE WELLS Oil	PRODUCTION OIL (MMbbls)
1985					
1986	1				
1987	1	1			
1988	1	1			
1989	1	1			
1990	1		1		
1991				6	
1992					
1993					2
1994					7
1995					7
1996					7
1997					7
1998					7
1999					7
2000					6
2001					5
2002					5
2003					4
2004					3
2005					3
2006					3
2007					2
2008					2
2009					2
2010					2
2011					2
TOTALS	5	3	1	6	83

Source: USDOI, MMS, Revised Exploration and Development Report for Sale 92, 1984.

miles are estimated to be surveyed. The actual level of activity may vary from this estimate for the following reasons: (1) the amount of recoverable petroleum may differ from the minimum-case resource estimate; (2) the proportion of site-specific surveys to the more extensive block-wide surveys may differ from the 50/50 assumption made here; (3) fewer than nine site surveys may be required due to production platforms being sited on abandoned exploratory well sites that have already been surveyed; (4) and more than nine site surveys may be performed if site-clearance work is done on lease blocks that are never drilled.

Exploration and production-well derived solids (muds and cuttings) resulting from the minimum-case scenario would be approximately .23 times less than those derived in the mean case. Between about 11,000 and 16,000 tons of cuttings and less than 1,344 tons of muds would be derived between 1986 and 1991.

C. Infrastructure Associated with Exploration, Development, and Production: Exploration, development, and production infrastructure would generally be the same as described for the mean case (proposal), with the exception of the trunk pipelines and the transshipment facility which would not be required. Also, the size and scope of support facilities could be smaller than for the proposal because of the lower resource estimates.

D. Environmental Consequences:

1. Effects on Biological Resources:

a. Effects on Fisheries Resources: The overall effects on fisheries resources due to oil spills and discharges of drilling fluids, cuttings, and formation waters associated with the minimum-case scenario would be less than those described for the mean case (proposal). A decrease in spill-contact probabilities for nearshore areas (particularly Port Moller) used by the more susceptible lifestages (i.e., eggs, larvae, and juveniles) of fisheries resources would be expected because (1) the minimum case assumes a resource level of 80 MMbbls of oil (compared to 364 MMbbls for the mean case), and (2) hydrocarbons are not transported through Port Moller to Balboa Bay by pipeline. The expected number of oil spills also would be reduced. In addition, drilling and production discharges would be diminished; consequently, localized lethal and sublethal concentrations that could affect a portion of one or more regional fisheries populations would decrease. There would be no oil-spill effects on the southern coast of the Alaska Peninsula because there would be no transshipment terminal or tankering activities out of Balboa Bay.

Discharges of drilling fluids, cuttings, and formation waters would still have some localized lethal or sublethal effects on fisheries resources. If an oil spill occurred, effects could be as described in Section IV.B.1.a.(1). As predicted for the development of the mean case, the overall level of effect of the minimum case on salmonids, forage fish, groundfish, and other invertebrates, is expected to be minor. Effects on red king crab would be expected to be major.

b. Effects on Marine and Coastal Birds: Decreasing projected oil resources from 364 to 80 MMbbls reduces the expected number of oil spills (1,000 bbls - 0.22 spill; 100,000 bbls - 0.005 spill) that could be associated with this lease sale. The probability of 1 or more 1,000-barrel-or-greater spills declines from 61 to 21 percent; the 100,000-barrel-or-greater spill probability is extremely low (0.5%). This level of development would result in a substantial reduction of risk to bird populations in potentially affected areas. In the vicinity of the Shumagin Islands (summer) and the lagoons of the Alaska Peninsula (spring, fall), effects are expected to be moderate. Elsewhere, and in other seasons, effects are likely to range from negligible to minor.

c. Effects on Pinnipeds and Sea Otters: The overall effects on sea otters and pinnipeds from oil spills and disturbances associated with development and transportation of extracted oil probably would be less than described for the proposed sale (mean case), since the spill rates and the volume of oil transported presumably would be reduced. However, short-term direct and indirect effects could occur in the event of an oil spill. Industrial activity still could disturb population segments of sea otters and pinnipeds, regardless of the absolute level of petroleum-resource estimates. Overall, effects on pinnipeds and sea otters probably would be minor under the minimum case, as compared to moderate in the mean case.

d. Effects on Endangered and Threatened Species: The overall effects on endangered species from direct and indirect effects of oil spills or disturbances associated with development and transport of extracted oil would be less than described for the mean case (proposal), since the spill rates and the volume of oil transported would be reduced. Short-term, localized effects could occur in the event of an oil spill, although about 2.5 times less oil would be available. Industrial activity during the migration and summer feeding periods in the lease sale area could still pose spill risks and/or potentially disturb at least local populations of endangered cetaceans, regardless of the absolute level of petroleum resource estimates. There would be no effect on species along the southern shore of the Alaska Peninsula, since no transshipment terminal would be built. Endangered species could be exposed to increases in tankering traffic, since no pipeline would be built and all oil would be loaded offshore and transported directly to markets. The level of effects on endangered species probably would be negligible in the minimum case.

e. Effects on Nonendangered Cetaceans: The overall effects on nonendangered cetaceans from direct and indirect effects of oil spills or disturbances associated with development and transport of extracted oil would be lower than described for the mean case (proposal), since spill rates and the volume of oil transported would be reduced. Short-term, localized effects could occur in the event of an oil spill, although about 2.5 times less oil would be available. Industrial activity during the migration and summer feeding periods in the lease sale area still could pose spill risks and/or potentially disturb at least local populations of nonendangered cetaceans, regardless of the absolute level of petroleum-resource estimates. There would be no effects on species along the southern shore of the Alaska Peninsula, since no transshipment terminal would be built. Nonendangered cetaceans could be exposed to increases in tankering traffic, since no pipeline would be built and all oil would be loaded offshore and transported directly to markets. The level of effects on nonendangered cetaceans probably would be negligible in the minimum case.

2. Effects on Social and Economic Systems:

a. Effects on Commercial Fishing Industry: Development of minimum-case resources would produce substantially lowered effects from those discussed in the proposal (see Sec.IV.B.2.a.). Space-use conflicts would be reduced to virtually nonexistent because there would be no oil or gas pipelines with the minimum case. Furthermore, the number of development platforms would be reduced from two to one, and the time period of development would decrease from 3 years to 1 year (1991-1992 instead of 1990-1993). The effects of space/catch loss on commercial fisheries are expected to decrease from minor in the proposal to neglibible in the minimum case.

In the minimum case, the level of exploration- and supply-vessel traffic would be reduced from the proposal (mean case) because there would be eight exploration and delineation wells rather than 10, and only one platform to serve (instead of two) during the development phase.

In addition, the development phase would be of shorter duration--only 1 year instead of 3 years. Therefore, the potential for interaction with fixed fishing gear would be lower, and this interaction would occur over a much shorter period than for the proposal. During the development phase, interference with crab pots could cause moderate effects on crab fisheries, but the likelihood of this happening is less than one-half what it is for the proposal because there would be only one platform (instead of two), and because the development phase is only for 1 (instead of 3) years. During the exploration and again during the production phases, potential effects on crab fisheries would be negligible.

Because fewer oil industry vessels would be in the area with the minimum case than with the proposal, longline- and trawl-gear loss would drop to negligible. The production of only 23 percent as much oil in the minimum case (80 MMbbls compared to 364 MMbbls in the proposal) would decrease oil-spill risks, and thus the risk of damaging gear and causing lost fishing time and income. Overall effects of oil spills are expected to decrease from minor to negligible with the minimum case.

b. Effects on Local Economy: Total employment effects would peak at about one-half the level of the peak employment of the mean case, and production-phase-employment effects would be about 60 percent as great as for the mean case. The overall economic effects of the minimum case would be minor.

c. Effects on Community Infrastructure: The demand for services and facilities in Cold Bay from OCS-generated-resident populations resulting from air-support operations in the minimum case would be about one-half of the projections for the proposal (mean case). Population levels projected for the minimum-resource level would indicate a negligible effect on the community's infrastructure. The small additional demand placed on existing services and facilities would be offset by a demand decrease resulting from population loss attributed to contraction of the labor force in the transportation, communication, and government sectors. With the exception of the water- and sewage-treatment systems, all basic services would be able to accommodate OCS and base-case population needs. The water- and sewage-treatment systems would require upgrading to meet minimum standards; however, these modifications would be required in the absence of OCS activities.

The demand for services and facilities in Unalaska resulting from OSC-marine-support operations would be about half that projected for the proposal. Generally, all basic services would require modifications to meet base-case and OCS-generated demands; however, OCS-generated service demands would account for less than 5 percent of the total demand over the life of the project. Population increases resulting from OCS operations in Unalaska would have a negligible effect on the city's infrastructure.

d. Effects on Subsistence-Use Patterns: The minimum case does not incorporate the Balboa Bay transshipment terminal scenario, because of the anticipated low level of resources. The resulting offshore-loading scenario, combined with much reduced levels of onshore and offshore activities, should all but eliminate effects on subsistence-use patterns in Bristol Bay and on the Alaska Peninsula and should greatly reduce potential effects at Unalaska and Cold Bay. Effects on subsistence-use patterns would be negligible.

e. Effects on Sociocultural Systems: The limited activity associated with the minimum case, and the use of offshore loading in place of the oil terminal on the Alaska Peninsula, suggest a more limited level of potential effects on sociocultural systems as a result of the lease sale. The effects should be all but eliminated in Bristol Bay and on the Alaska Peninsula and should be reduced at Unalaska and Cold Bay. The effects on Unalaska, Cold Bay, Bristol Bay, and the Alaska Peninsula would be negligible as compared to minor for Sand Point.

APPENDIX C

Population Projections for the Cities of Unalaska and Cold Bay

Prepared by

Minerals Management Service

Appendix C
Population Projections for the Cities of Unalaska and Cold Bay

The following tables in this appendix provide population projections for the base case (future without the proposal) and Proposal (Alternative I) for the cities of Unalaska and Cold Bay.

Table C-1	Base-Case Population Projections for the City of Unalaska
Table C-2	Base-Case Population Projections for the City of Cold Bay
Table C-3	Population Projections (Including the Effects of the Proposal) for the City of Unalaska
Table C-4	Population Projections (Including the Effects of the Proposal) for the City of Cold Bay

Table C-1
Base-Case Population Projections for the
City of Unalaska

	Resident Population	Non-Project Enclave Population	Project Enclave Population	Military Enclave Population	Total Population Including Enclaves and Military
1981	687	609	0	0	1,296
1982	665	233	0	0	898
1983	652	166	0	0	818
1984	791	186	119	0	1,097
1985	756	262	60	0	1,079
1986	830	337	98	0	1,264
1987	903	412	170	0	1,485
1988	889	488	43	0	1,420
1989	911	593	9	0	1,513
1990	975	699	12	0	1,686
1991	1,089	854	10	0	1,953
1992	1,139	1,009	10	0	2,158
1993	1,223	1,165	8	0	2,396
1994	1,313	1,320	6	0	2,639
1995	1,427	1,476	79	0	2,982
1996	1,579	1,576	159	0	3,314
1997	1,808	1,676	253	0	3,737
1998	1,985	1,776	163	0	3,924
1999	2,275	1,776	66	0	4,117
2000	2,235	1,776	0	0	4,011
2001	2,233	1,776	0	0	4,009
2002	2,229	1,776	0	0	4,005
2003	2,227	1,776	0	0	4,003
2004	2,226	1,776	0	0	4,002
2005	2,224	1,776	0	0	4,000
2006	2,223	1,776	0	0	3,999
2007	2,222	1,776	0	0	3,998
2008	2,221	1,776	0	0	3,997
2009	2,221	1,776	0	0	3,997
2010	2,220	1,776	0	0	3,996

Source: University of Alaska, ISER, 1984.

Table C-2
Base-Case Population Projections for the
City of Cold Bay

	Resident Population	Non-Project Enclave Population	Project Enclave Population	Military Enclave Population	Total Population Including Enclaves and Military
1981	225	0	0	0	225
1982	226	0	0	0	226
1983	197	0	0	0	197
1984	198	0	97	0	295
1985	186	0	76	0	262
1986	186	0	137	0	323
1987	179	0	124	0	303
1988	169	0	56	0	225
1989	161	0	16	0	177
1990	159	0	16	0	175
1991	159	0	10	0	169
1992	157	0	10	0	167
1993	157	0	10	0	167
1994	157	0	10	0	167
1995	156	0	10	0	166
1996	164	0	10	0	174
1997	184	0	40	0	224
1998	206	0	50	0	256
1999	214	0	40	0	254
2000	211	0	0	0	211
2001	211	0	0	0	211
2002	210	0	0	0	210
2003	210	0	0	0	210
2004	210	0	0	0	210
2005	210	0	0	0	210
2006	210	0	0	0	210
2007	210	0	0	0	210
2008	210	0	0	0	210
2009	209	0	0	0	209
2010	209	0	0	0	209

Source: University of Alaska, ISER, 1984.

Table C-3
Population Projections
(Including the Effects of the Proposal)
for the City of Unalaska

	Resident Population	Non-Project Enclave Population	Project Enclave Population	Military Enclave Population	Total Population Including Enclaves and Military
1981	687	609	0	0	1,296
1982	665	233	0	0	898
1983	652	166	0	0	818
1984	791	186	119	0	1,097
1985	756	262	60	0	1,079
1986	850	337	122	0	1,310
1987	906	412	174	0	1,492
1988	893	488	48	0	1,429
1989	915	593	15	0	1,523
1990	996	699	45	0	1,740
1991	1,101	854	31	0	1,987
1992	1,223	1,009	142	0	2,375
1993	1,309	1,165	13	0	2,487
1994	1,425	1,320	6	0	2,751
1995	1,536	1,476	79	0	3,091
1996	1,686	1,576	159	0	3,421
1997	1,914	1,676	254	0	3,844
1998	2,091	1,776	163	0	4,030
1999	2,381	1,776	66	0	4,223
2000	2,341	1,776	0	0	4,117
2001	2,338	1,776	0	0	4,114
2002	2,334	1,776	0	0	4,110
2003	2,332	1,776	0	0	4,108
2004	2,330	1,776	0	0	4,106
2005	2,326	1,776	0	0	4,102
2006	2,324	1,776	0	0	4,100
2007	2,323	1,776	0	0	4,099
2008	2,322	1,776	0	0	4,198
2009	2,321	1,776	0	0	4,097
2010	2,318	1,776	0	0	4,094

Source: University of Alaska, ISER, 1984.

Table C-4
Population Projections
(Including the Effects of the Proposal)
for the City of Cold Bay

	Resident Population	Non-Project Enclave Population	Project Enclave Population	Military Enclave Population	Total Population Including Enclaves and Military
1981	225	0	0	0	225
1982	226	0	0	0	226
1983	197	0	0	0	197
1984	198	0	97	0	295
1985	186	0	76	0	162
1986	189	0	168	0	357
1987	179	0	130	0	309
1988	169	0	64	0	233
1989	162	0	27	0	189
1990	162	0	43	0	205
1991	161	0	28	0	189
1992	169	0	143	0	312
1993	209	0	14	0	223
1994	228	0	10	0	238
1995	227	0	10	0	237
1996	235	0	10	0	245
1997	255	0	40	0	295
1998	277	0	50	0	327
1999	285	0	40	0	325
2000	282	0	0	0	282
2001	281	0	0	0	281
2002	281	0	0	0	281
2003	281	0	0	0	281
2004	281	0	0	0	281
2005	279	0	0	0	279
2006	279	0	0	0	279
2007	279	0	0	0	279
2008	278	0	0	0	278
2009	278	0	0	0	278
2010	276	0	0	0	276

Source: University of Alaska, ISER, 1984.

APPENDIX D

Economic Tables for the Base Case and Proposal (Alternative I)

Prepared by

Minerals Management Service

Appendix D

Economic Tables for the Base Case and Proposal (Alternative I)

The following tables in this appendix provide historical information about employment, population, and income in the Aleutian Islands Census Division and in the communities of Unalaska/Dutch Harbor and Cold Bay. Also provided are projections of employment to the year 2010 in the communities of Unalaska/Dutch Harbor and Cold Bay, with and without the proposed North Aleutian Basin (Sale 92).

Table D-1

Average Monthly Wage and Salary Employment in the Aleutian Islands Census Division (1965 - 1980)

(Dollars)

Industry	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Construction	54	137	125	142	195	285	187	181	180	235	221	116	140	98	114
Manufacturing	411	422	471	349	476	657	610	675	851	783	991	1130	1621	1739	1720
Transportation, Communications, and Utilities	55	51	46	57	45	61	41	93	93	87	88	38	31	55	90
Wholesale-Retail Trade	138	152	138	134	136	125	124	142	137	148	149	110[e]	101[e]	114[e]	116[e]
Finance, Insurance, and Real Estate	4[e]	4[e]	1[e]	5[e]	7[e]	7[e]	8[e]	7[e]	12	27	32	37	38	40[e]	76[e]
Services	13[e]	108[e]	232[e]	268	143	240	82	47	33	20	93	150	171	180	152
Federal Government, Total	707	633	550	523	528	574	640	704	813	626	618	569	682	704	676
(Military-Related)	(n.a.)	(n.a.)	(n.a.)	(n.a.)	(n.a.)	(n.a.)	(n.a.)	(n.a.)	(n.a.)	(n.a.)	(n.a.)	(n.a.)	(486)	(405)[e]	(424)[e]
State, Local Government	138	157	160	174	168	178	206	227	257	316	330	287	371	387	408
Miscellaneous and Unclassified 1/	6[e]	50[e]	112[e]	75[e]	23[e]	51[e]	84[e]	110[e]	97	107[e]	99[e]	37[e]	0	0	11
Civilian Job Total	1526	1714	1835	1727	1721	2178	1982	2186	2473	2349	2621	2474	3155	3317	3363
Military Personnel (active duty only)	n.a.	n.a.	n.a.	3927	3833	3994	3263	3314	3347	3410	3753	3026	2868	2392	2504
Total	n.a.	n.a.	n.a.	5654	5554	6172	5245	5500	5820	5759	6374	5500	6023	5709	5867

Sources: Statistical Quarterly (Alaska Dept. of Labor). The figure of 486 for the number of military-related civilian Federal government jobs in the year 1978 is from Numbers - Basic Economic Statistics of Alaska Census Divisions (Alaska Dept. of Commerce and Economic Development, November 1979). Comparable figures for 1979 and 1980 were estimated based on changes in numbers of active-duty military personnel. Numbers of military personnel were obtained from unpublished reports of the U.S. Bureau of Economic Analysis.

e = estimated

n.a. = information not available

1/ Includes sand and gravel operations related to construction.

Table D-2
Population and Estimated Per Capita Money Income by Place in the Aleutian Islands Census Division[1/]

Community	1970	1980	1970-80 Change	1970-80 Percent Change	Estimated Per Capita Money Income 1969	1977
Adak	$4,022	$3,313	-$709	- $18	--	--
Unalaska	342	1,322	980	+ 287	$2,636	$8,290
Sand Point	360	619	259	+ 72	3,274	9,483
Shemya Station	1,131	600	- 531	- 47	--	--
St. Paul	450	551	101	+ 22	2,290	6,410
King Cove	283	462	179	+ 63	2,368	6,830
Cold Bay	256	228	- 28	- 11	--	--
* Chignik	83	179	+ 96	+ 116	--	--
St. George	163	158	- 5	- 3	--	--
* Chignik Lake	117	138	+ 21	+ 18	--	--
Akutan	101	126	+ 25	+ 25	--	--
* Perryville	94	108	+ 14	+ 15	--	--
Atka	88	93	+ 5	+ 6	--	--
False Pass	62	65	+ 3	+ 5	--	--
Nelson Lagoon	43	59	+ 16	+ 7	--	--
Nikolski	57	50	- 7	- 12	--	--
* Chignik Lagoon	0	48	+ 48	--	--	--
* Ivanof Bay	48	41	- 7	- 15	--	--
Attu	0	29	+ 29	--	--	--
Belkofski	59	10	- 49	- 83	--	--
Squaw Harbor	65	6	- 59	- 91	--	--
Other	233	85	- 148	- 64	--	--
Census Division Totals	$8,057	$8,290	+$233	+$ 3	$3,317	$7,932

1/ The Aleutian Islands Census Division is the geographic area used by the U.S. Census Bureau for the collection and presentation of data in the 1970 census. The area used for the 1980 census is similar, except for the exclusion of the five communities indicated above by asterisks (*). The larger 1970 census division corresponds to the geographic area used by the Alaska Dept. of Labor and the U.S. Bureau of Economic Statistics for the reporting of employment, personal income, and other types of economic statistics.

Source: State of Alaska, Department of Labor, January 1981; U.S. Bureau of the Census, June 1980; U.S. Bureau of the Census, March 1981.

Table D-3
Cold Bay Labor Force By Sector - 1982

Industry	Total Employees		Percent of Total Labor Force	
Government	63		40.9	
Federal	43		27.9	
Federal Aviation Admin.		16		10.4
National Weather Service		5		3.2
Fish & Wildlife Service		4		2.6
U.S. Post Office		2		1.3
Federal Military (USAF)		16		10.4
State	19		12.3	
Dept. of Transportation		6		3.9
Dept. of Fish & Game		7		4.5
R.E.A.A. (School System)		5		3.2
Magistrate		1		0.7
Municipal	1		0.7	
Clerk		1		0.7
Private Employers	91		59.1	
Transportation	34		22.1	
Reeve Aleutian Airways		22		14.3
Peninsula Airlines		10		6.5
Cold Bay Truck Rental		2		1.3
Communications	31		20.1	
R.C.A.		28		18.2
Alascom		2		1.3
Interior Telephone Co.		1		0.7
Service	18		11.7	
Flying Tigers Lines		16		10.4
Northern Power Co.		2		1.3
Manufacturing/Processing	6		3.9	
Northern Peninsula Fisheries		5		3.2
Seawest		1		0.7
Construction	2		1.3	
Well Digger		1		0.7
Laborer		1		0.7
TOTAL	154		100.0	

Source: Impact Assessment, Inc., 1983.

Table D-4
Total Employment, Basic Employment, Secondary Employment[1/] and Resident Status of Workers, by Industry, for Unalaska (Dutch Harbor) - 1980

INDUSTRY CLASSIFICATION	(1) BASIC INDUSTRY JOBS: BASIC JOBS HELD BY PERMANENT RESIDENTS	(2) BASIC INDUSTRY JOBS: BASIC JOBS HELD BY TRANSIENT WORKERS	(3) BASIC INDUSTRY JOBS: TOTAL BASIC EMPLOYMENT	(4) SECONDARY[1/] JOBS (ALL HELD BY RESIDENTS)	(5) TOTAL EMPLOYMENT (BASIC & SECONDARY)
(1) Fish Harvesting.	35	115	150	0	150
(2) Fish Processing.	117	1,049	1,166	0	1,166
(3) Mining.	2	0	2	0	2
(4) Construction.	0	0	0	12	12
(5) Transportation, Communication, & Utilities...	14	0	14	43	57
(6) Trade.	0	0	0	60	60
(7) Finance, Insurance, & Real Estate.	20	0	20	7	27
(8) Services.	0	0	0	44	44
(9) Federal & State Gov't...	6	0	6	12	18
(10) Local Government.	0	0	0	64	64
(11) All-Industry Totals ...	194	1,164	1,358	242	1,600

Source: All information about the total number of jobs, by industry, and information about which jobs serve the local market (secondary jobs) and which jobs serve markets outside the local community (basic jobs) is taken from pages 14-18 of OCS Technical Report Number 59 (Alaska Consultants, Inc., May 1981). The information is based on a special survey of employers that was conducted by Alaska Consultants. Assumptions about the number of fishermen and fish-processing workers who are permanent residents and the number who are transient workers are based on information from pages 48-50 of OCS-Technical Report Number 57 (Institute of Social and Economic Research, April 1981), supplemented by information from miscellaneous sources.

1/ All employment figures are stated in terms of annual average (12-month) fulltime equivalent jobs.

Table D-5
Annual Average Employment at Unalaska/Dutch Harbor (1981 - 2010)
with and without
the Proposal (Alternative I)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	PROJECTED EMPLOYMENT WITHOUT THE LEASE SALE			ESTIMATED EMPLOYMENT EFFECTS OF THE PROPOSED LEASE SALE			TOTAL PROJECTED EMPLOYMENT WITH THE LEASE SALE OCCURS			PERCENTAGE INCREASES DUE TO THE LEASE SALE		
YEAR	RESIDENT EMPLOYMENT	ENCLAVE EMPLOYMENT	TOTAL EMPLOYMENT	RESIDENT EMPLOYMENT	ENCLAVE EMPLOYMENT	TOTAL EMPLOYMENT	RESIDENT EMPLOYMENT	ENCLAVE EMPLOYMENT	TOTAL EMPLOYMENT	RESIDENT EMPLOYMENT	ENCLAVE EMPLOYMENT	TOTAL EMPLOYMENT
1981	368	609	977	0	0	0	368	609	977	0	0	0
1982	352	233	585	0	0	0	352	233	585	0	0	0
1983	341	166	507	0	0	0	341	166	507	0	0	0
1984	426	305	731	0	0	0	426	305	731	0	0	0
1985	401	322	724	0	0	0	401	322	724	0	0	0
1986	445	435	879	13	25	38	457	459	917	3	6	4
1987	488	582	1,069	2	4	6	490	586	1,075	0	1	1
1988	476	531	1,007	2	5	7	479	536	1,014	0	1	1
1989	487	602	1,089	3	6	9	490	608	1,098	1	1	1
1990	524	711	1,235	13	33	46	537	744	1,281	3	5	4
1991	593	864	1,457	8	21	29	600	885	1,486	1	2	2
1992	621	1,019	1,640	53	132	185	674	1,151	1,825	8	13	11
1993	671	1,173	1,844	54	5	59	724	1,178	1,903	8	0	3
1994	724	1,326	2,050	70	0	70	794	1,326	2,120	10	1	3
1995	793	1,555	2,347	68	0	68	861	1,555	2,416	9	0	3
1996	885	1,735	2,619	67	0	67	951	1,735	2,686	8	0	3
1997	1,025	1,929	2,954	66	0	67	1,091	1,930	3,021	6	0	2
1998	1,133	1,939	3,071	66	0	66	1,199	1,939	3,137	6	0	2
1999	1,311	1,842	3,153	66	0	66	1,377	1,842	3,219	5	0	2
2000	1,284	1,776	3,060	66	0	66	1,350	1,776	3,126	5	0	2
2005	1,262	1,776	3,038	64	0	64	1,326	1,776	3,102	5	0	2
2010	1,245	1,776	3,021	61	0	61	1,305	1,776	3,081	5	0	2

Source: Technical Report 87: St. George Basin and North Aleutian Shelf Economic and Demographic Systems Analysis, prepared by the Institute of Social and Economic Research, University of Alaska.

Note: The projections of resident employment and total employment (Columns 1,3,4,6,7, and 9) represent jobs in all industry categories. The no-sale projections of enclave employment in Column 2 include fish-processing jobs filled by seasonal workers housed in dormitories, in addition to petroleum-industry jobs filled by commuters, also housed in dormitories, who would leave the region frequently for extended periods of rest and recreation. The petroleum-industry jobs included in Column 2 are jobs that would result from OCS Sale 70 (assuming exploration only), Sale 83 (assuming a commercial discovery), and Sale 89 (assuming exploration only). The enclave jobs resulting from proposed Sale 92, in Column 5, consist entirely of additional petroleum-industry jobs filled by commuters housed in dormitories during work periods, who would leave the region frequently for extended periods of rest and recreation.

Table D-6
Annual Average Employment at Cold Bay (1981 - 2010)
with and without
the Proposal (Alternative I)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	PROJECTED EMPLOYMENT WITHOUT THE LEASE SALE			ESTIMATED EMPLOYMENT EFFECTS OF THIS PROPOSED LEASE SALE			TOTAL PROJECTED EMPLOYMENT WITH THE LEASE SALE			PERCENTAGE INCREASES DUE TO THIS LEASE SALE		
YEAR	RESIDENT EMPLOYMENT	ENCLAVE EMPLOYMENT	TOTAL EMPLOYMENT	RESIDENT EMPLOYMENT	ENCLAVE EMPLOYMENT	TOTAL EMPLOYMENT	RESIDENT EMPLOYMENT	ENCLAVE EMPLOYMENT	TOTAL EMPLOYMENT	RESIDENT EMPLOYMENT	ENCLAVE EMPLOYMENT	TOTAL EMPLOYMENT
1981	153	0	153	0	0	0	153	0	153	0	0	0
1982	154	0	154	0	0	0	154	0	154	0	0	0
1983	134	0	134	0	0	0	134	0	134	0	0	0
1984	134	97	231	0	0	0	134	97	231	0	0	0
1985	126	76	202	0	0	0	126	76	202	0	0	0
1986	126	137	263	2	31	33	128	168	296	1	23	13
1987	121	124	245	0	6	6	122	130	252	0	5	2
1988	115	56	171	8	8	16	115	64	179	0	14	5
1989	110	16	126	1	11	12	110	27	137	1	69	9
1990	108	16	124	2	27	29	110	43	153	1	169	23
1991	108	10	118	1	18	19	109	28	137	1	180	16
1992	107	10	117	8	133	141	115	143	258	7	1330	121
1993	106	10	116	36	4	40	142	14	156	33	40	34
1994	106	10	116	49	0	49	155	10	165	46	0	42
1995	106	10	116	48	0	48	154	10	164	46	0	42
1996	111	10	121	48	0	48	160	10	170	43	0	40
1997	125	40	165	48	0	48	173	40	213	39	0	29
1998	140	50	190	48	0	48	188	50	213	34	0	25
1999	145	40	185	48	0	48	194	40	234	33	0	26
2000	143	0	143	48	0	48	191	0	191	34	0	34
2005	143	0	143	47	0	47	189	0	189	33	0	33
2010	142	0	142	45	0	45	188	0	188	32	100	32

Source: Technical Report 87: St. George Basin and North Aleutian Shelf Economic and Demographic Systems Analysis, prepared by the Institute of Social and Economic Research, University of Alaska.

Note: The projections of resident employment and total employment (Columns 1,3,4,6,7, and 9) represent jobs in all industry categories. The no-sale projections of enclave employment in Column 2 represent petroleum-industry jobs filled by commuters, housed in dormitories, who would leave the region frequently for extended periods of rest and recreation. The petroleum-industry jobs included in Column 2 are jobs that would result from OCS Sale 70 (assuming exploration only), Sale 83 (assuming a commercial discovery), and Sale 89 (assuming exploration only). The enclave jobs resulting from proposed Sale 92, in Column 5, consist entirely of additional petroleum-industry jobs filled by commuters, housed in dormitories during work periods, who would leave the region frequently for extended periods of rest and recreation.

APPENDIX E

Community Infrastructure Projections for the Cities of Unalaska and Cold Bay

Prepared by

Minerals Management Service

Appendix E
Community Infrastructure Projections for the Cities of Unalaska and Cold Bay

The tables in this appendix provide community infrastructure projections for the base case (Future without the Proposal) and proposal (Alternative I) for the North Aleutian Basin lease sale. These projections are based on the following assumptions: (1) industry would provide facilities and services for all employees residing in an enclave, and only employees who become permanent residents of the community would use local infrastructure; and (2) industry would develop the electrical- and water-supply capacity to meet support-base functions. An overall listing of tables is organized as follows:

Table E-1
Effects on Schools, School Years 1982/1983 to 2009/2010
Enrollments and (Classrooms)1/

City	1982/1983	1985 Base-Case Projections	1985 Needs with Lease Sale	1985 Increment Due to Lease Sale	1990 Base-Case Projections	1990 Needs with Lease Sale	1990 Increment Due to Lease Sale	1995 Base-Case Projections	1995 Needs with Lease Sale	1995 Increment Due to Lease Sale
		Enrollment and (Number of Classrooms)								
Cold Bay	50 (4)	26 (3/)	26 (3/)	0 (0)	23 (3/)	23 (3/)	0 (0)	22 (3/)	32 (3/)	10 (0)
Unalaska	165 (20)2/	177 (3/)	182 (3/)	5 (0)	230 (3/)	235 (3/)	5 (0)	338 (3/)	363 (3/)	23 (1)

City	2000 Base-Case Projections	2000 Needs with Lease Sale	2000 Increment Due to Lease Sale	2005 Base-Case Projections	2005 Needs with Lease Sale	2005 Increment Due to Lease Sale	2010 Base-Case Projections	2010 Needs with Lease Sale	2010 Increment Due to Lease Sale
Cold Bay	30 (3/)	40 (3/)	10 (0)	30 (3/)	40 (3/)	10 (0)	30 (3/)	39 (3/)	9 (0)
Unalaska	527 (26.5)	551 (27.5)	24 (1)	528 (26.5)	551 (27.5)	24 (1)	530 (26.5)	552 (27.5)	22 (1)

Source: Calculated by the MMS from the Institute of Social and Economic Research, University of Alaska, Technical Report No. 87, "Impact Analysis of the St. George Lease Offering and the North Aleutian Shelf Lease Offering," Anchorage, AK: U.S. Dept. of the Interior, Minerals Management Service, Alaska Outer Continental Shelf Region 1984.

1/ Facility projections represent the number of classrooms necessary to maintain a 20:1 student:classroom ratio. Number of classrooms is indicated in parenthesis.

2/ Figures are for the 1981/1982 school year.

3/ Enrollments are projected to be less than the capacity of the school. No additional classrooms would be necessary.

Table E-2
Effects on Electrical-Capacity Requirements, 1984-2010
(Kilowatts)

City	1984 Capacity of Existing Electrical System	1985 Base-Case Projections 1/	1985 Needs with Lease 2/ Sale	1985 Increment Due to Lease Sale	1990 Base-Case Projections 1/	1990 Needs with Lease 2/ Sale	1990 Increment Due to Lease Sale	1995 Base-Case Projections 1/	1995 Needs with Lease 2/ Sale	1995 Increment Due to Lease Sale
Cold Bay	1,600	698	698	0	596	608	12	585	851	266
Unalaska	1,200	2,835	2,921	86	3,656	3,735	79	5,351	5,760	409

City	2000 Base-Case Projections 1/	2000 Needs with Lease 2/ Sale	2000 Increment Due to Lease Sale	2005 Base-Case Projections 1/	2005 Needs with Lease 2/ Sale	2005 Increment Due to Lease Sale	2010 Base-Case Projections 1/	2010 Needs with Lease 2/ Sale	2010 Increment Due to Lease Sale
Cold Bay	791	1,058	267	788	1,046	258	784	1,035	251
Unalaska	8,381	8,741	360	8,340	8,723	383	8,325	8,693	368

Source: Calculated by the MMS from the Institute of Social and Economic Research, University of Alaska, Technical Report No. 87, "Impact Analysis of the St. George Lease Offering and the North Aleutian Shelf Lease Offering," Anchorage, AK: U.S. Dept. of the Interior, Minerals Management Service, Alaska Outer Continental Shelf Region (1984).

1/ Base-case estimates of electrical-capacity requirements are based on an installed capacity of 3.75 kilowatts per resident (Alaska Consultants, 1981).

2/ Projected electrical-capacity requirements for the Proposal (Alternative 1) are based on an installed capacity of 3.75 kilowatts per new resident (Alaska Consultants, 1981).

Table E-3
Effects on Water-Supply Requirements, 1984-2010
(Million Gallons Per Day [MGD])

City	1984 Capacity of Existing Water System	1985 Base-Case Projections	1985 Needs with Lease Sale	1985 Increment Due to Lease Sale	1990 Base-Case Projections	1990 Needs with Lease Sale	1990 Increment Due to Lease Sale	1995 Base-Case Projections	1995 Needs with Lease Sale	1995 Increment Due to Lease Sale
Cold Bay[1/]	.030	.023	.023	0	.020	.020	0	.020	.028	.008
Unalaska[2/]	17.3	5.97	6.41	.44	9.81	10.10	.29	17.02	17.66	.64

City	2000 Base-Case Projections	2000 Needs with Lease Sale	2000 Increment Due to Lease Sale	2005 Base-Case Projections	2005 Needs with Lease Sale	2005 Increment Due to Lease Sale	2010 Base-Case Projections	2010 Needs with Lease Sale	2010 Increment Due to Lease Sale
Cold Bay[1/]	.026	.035	.009	.026	.035	.009	.026	.035	.009
Unalaska[2/]	23.51	24.13	.62	23.45	24.05	.60	23.42	24.00	.58

Source: Calculated by the MMS from the Institute of Social and Economic Research, University of Alaska, Technical Report No. 87, "Impact Analysis of the St. George Lease Offering and the North Aleutian Shelf Lease Offering," Anchorage, AK: U.S. Dept. of the Interior, Minerals Management Service, Alaska Outer Continental Shelf Region (1984).

1/ Baseline water projections for Cold Bay are based on total population. Domestic demand is assumed to be approximately 125 gallons per person per day (Alaska Consultants, 1981). All figures are rounded to the nearest .001 MGD.

2/ Baseline water-demand projections for Unalaska are based on a standard of 170 gallons per person per day, with domestic demands accounting for 2.9 percent of total projected water consumption throughout the forecast period (Centaur Associates, 1984). Calculations do not include OCS-enclave workers for previous sales. It is assumed that industry would provide for their needs. All figures are rounded to the nearest .01 MGD.

Table E-4
Effects on Sewage-Treatment Facilities, 1984-2010
(Million Gallons Per Day [MGD] of Effluent)

City	1984	1985			1990			1995		
	Capacity of Existing Treatment Facilities	Base-Case Projections	Needs with Lease Sale	Increment Due to Lease Sale	Base-Case Projections	Needs with Lease Sale	Increment Due to Lease Sale	Base-Case Projections	Needs with Lease Sale	Increment Due to Lease Sale
Cold Bay[1/]	.0225	.023	.023	0	.020	.020	a	.020	.028	.008
Unalaska[2/]	not available	.173	.177	.004	.285	.288	.003	.494	.512	.018
		2000			2005			2010		
Cold Bay[1/]		.026	.035	.009	.026	.035	.009	.026	.035	.009
Unalaska[2/]		.682	.700	.018	.680	.697	.017	.679	.696	.017

Source: Calculated by the MMS from Institute of Social and Economic Research, University of Alaska, Technical Report No. 87, "Impact Analysis of the St. George Lease Offering and the North Aleutian Shelf Offering," Anchorage, AK: U.S. Dept. of the Interior, Minerals Management Service, Alaska Outer Continental Shelf Region (1984).

1/ All figures represent millions of gallons per day of effluent and are based on a standard of 125 gallons of effluent per person per day (Alaska Consultants, 1981). All figures are rounded to the nearest .001 MGD.

2/ All figures represent millions of gallons per day of effluent and are based on a standard of 170 gallons of effluent per person per day. All figures are rounded to the nearest .001 MGD.

a = Less than .001 MGD of effluent.

Table E-5
Effects on Health Care, 1984-2010
Beds and (Physicians)[1/]

City	1984 Existing Health Care Beds and (Physicians)	1985 Base-Case Projections	1985 Needs with Lease Sale	1985 Increment Due to Lease Sale	1990 Base-Case Projections	1990 Needs with Lease Sale	1990 Increment Due to Lease Sale	1995 Base-Case Projections	1995 Needs with Lease Sale	1995 Increment Due to Lease Sale
Unalaska	3(1)	3(1)	3(1)	0(0)	3(1)	3(1)	0(0)	3(2)	3(2)	0(0)

City	2000 Base-Case Projections	2000 Needs with Lease Sale	2000 Increment Due to Lease Sale	2005 Base-Case Projections	2005 Needs with Lease Sale	2005 Increment Due to Lease Sale	2010 Base-Case Projections	2010 Needs with Lease Sale	2010 Increment Due to Lease Sale
Unalaska	7(2)	6(3)	0(0)	6(3)	7(2)	0(0)	7(2)	7(2)	0(0)

Source: Calculated by the MMS from Institute of Social and Economic Research, University of Alaska, Technical Report No. 87, "Impact Analysis of the St. George Lease Offering and the North Aleutian Shelf Lease Offering." Anchorage, AK: U.S. Dept. of the Interior, Minerals Management Service, Alaska Outer Continental Shelf Region (1984).

1/ The physician forecast is based on a ratio of one physician per increment of 1,500 additional residents over a base population of 3,000 (Alaska Consultants, 1981). The acute-care-bed forecast is based on a ratio of 3.5 beds per increment of 1,000 additional residents over a base population of 3,000 (Alaska Consultants, 1981). Projections for Cold Bay were not included because additional physicians and acute-care beds would not be necessary due to the small population increases.

Table E-6
Effects on Law Enforcement, 1984-2010
Officers and (Detention Cells)1/

City	1984	1985			1990			1995		
	Existing No. of Law Enforcement Officers/ (Detention Cells)	Base Case Projections	Needs with Lease Sale	Increment Due to Lease Sale	Base-Case Projections	Needs with Lease Sale	Increment Due to Lease Sale	Base Case Projections	Needs with Lease Sale	Increment Due to Lease Sale
Cold Bay	1(1)	1(3)	1(3)	0(0)	1(3)	1(3)	0(0)	1(3)	1(3)	0(0)
Unalaska	18(3)	18(3)	18(3)	0(0)	19(4)	19(4)	0(0)	24(9)	24(9)	0(0)

City	2000			2005			2010		
Cold Bay	1(3)	1(3)	0(0)	1(3)	1(3)	0(0)	1(3)	1(3)	0(0)
Unalaska	27(12)	27(12)	0(0)	27(12)	27(12)	0(0)	27(12)	27(12)	0(0)

Source: Calculated by the MMS from Institute of Social and Economic Research, University of Alaska, Technical Report No. 87, "Impact Analysis of the St. George Lease Offering and the North Aleutian Shelf Lease Offering," Anchorage, AK: U.S. Dept. of the Interior, Minerals Management Service, Alaska Outer Continental Shelf Region (1984).

1/ Police officer and detention-cell projections are based on a standard of one additional officer and detention cell for each additional population increment of 300 (Alaska Consultants, 1981). Projections for Alternative II (No Sale) are based on total population.

APPENDIX F

History of Seismic Activity in

the North Aleutian Basin

Prepared by

Minerals Management Service

History of Seismic Surveys in the North Aleutian Basin

Much marine seismic work has been done in the North Aleutian Basin area by government agencies, research institutes and universities, and private industry. All seismic work conducted on unleased lands, including work conducted by industry, requires a permit (except for scientific research [30 CFR 251.-4-2] and U.S. Government agencies). This work has been regulated by the U.S. Department of the Interior. The first geophysical permit in the North Aleutian Basin was issued in 1963. From 1963 through 1982, 46 surveys were completed under permits. Of these, four were high-resolution surveys and 42 were deep-seismic surveys. A total of 51,034 trackline miles were surveyed by industry from 1963 through 1982, of which 4,751 were high-resolution and 46,283 were deep-seismic.

The high-resolution surveys used either a sparker (from 800-Joule [J] through 24-kilojoule [kJ] energy level) or a 500-J boomer as a sound source. In addition, 3.5-kilohertz [kHz] and 12-kHz subbottom profilers and fathometer systems were used. Most of the deep-seismic surveys run by industry used an array of airguns for a sound source. Sleeve exploders and waterguns also were listed in some North Aleutian Basin permits.

Some high-resolution seismic data from the North Aleutian Basin also have been acquired by the U.S. Geological Survey (USGS). The Geological Division of USGS collected approximately 680 trackline miles of data in 1976 for the Outer Continental Shelf Environmental Assessment Program (OCSEAP). The instruments used in this survey included 3.5-kHz and 12-kHz subbottom profilers and an array of five airguns. USGS also collected approximately 1,800 trackline miles of high-resolution data in 1981. A detailed technical discussion of the USGS marine-seismic equipment is found in Brune et al. (1979). In 1981, the Conservation Division of USGS (now part of Minerals Management Service) acquired 2,491 trackline miles of high-resolution data by contract, in preparation for Sale 75. This survey used various sound sources which included an array of up to four 15-cubic-inch waterguns, an 800-J sparker, a 3.5-kHz subbottom profiler, a fathometer, and a sidescan sonar. A listing of other marine-seismic work performed by governmental agencies and universities in the southern Bering Sea is contained in Cooper et al. (1979). In addition, an industry survey was done for the deep stratigraphic test (DST) well in the North Aleutian Basin. This was a high-resolution survey to investigate shallow drilling hazards.

APPENDIX G

Oil-Spill-Risk Analysis

Prepared by

Minerals Management Service

APPENDIX G

Oil-Spill-Risk Analysis

The tables listed in this appendix represent two types of probabilities:

1) Conditional Probabilities (Tables G-1 through G-9): these probabilities express the likelihood that a spill originating from a given location (launch points shown on Graphic 5) will contact a certain boundary segment or biological resource area. Probabilities are based solely on meteorological and oceanographic conditions.

2) Combined (Final) Probabilities (Tables G-10 through G-26): these probabilities express the likelihood that a given boundary segment or biological resource area will be contacted by an oil spill over the life of the oil field. These probabilities are based on the estimated level of resource (volume of oil) and the estimated spill rates.

Figures G-1 and G-2 show the different targets analyzed in this oil-spill-risk analysis. Twenty-three open-water targets (shown in Fig. G-1), 14 biological resource areas (Fig. G-2), and 200 boundary segments (Graphic 5) were included and used by the analysts to arrive at the effects discussed in Section IV of this EIS.

Table G-1. -- Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain Resource Area within 3 days.

Target	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	B1
	Hypothetical Spill Location																								
Land	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	46	n	n	n	n	n	n
Resource Area 1	n	n	n	n	9	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	**	n	n	n	n	n	n
Resource Area 3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 4	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 5	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 6	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 7	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 8	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 9	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 10	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 11	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 12	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 13	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	**	n	n	n
Resource Area 14	n	n	n	n	n	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.

Table G-1. (Continued) -- Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain Resource Area within 3 days.

Target	Hypothetical Spill Location																							
	B2	B3	B15	D1	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20	P21
Land	n	5	n	19	n	n	n	n	n	4	n	n	n	n	n	n	n	n	14	5	n	n	n	n	n
Resource Area 1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	5	n	n	n	n	n
Resource Area 4	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 5	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 6	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 7	n	35	n	**	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 8	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 9	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 10	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 11	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 12	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 13	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 14	n	n	n	n	n	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.

Table G-1. (Continued) -- Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain Resource Area within 3 days.

Target	Hypothetical Spill Location																								
	P22	P23	P24	P25	P26	F1	F2	F3	F4	F5	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12	E13	E14	E15
Land	n	n	n	n	n	n	5	2	n	n	n	n	2	n	n	3	n	n	25	n	n	2	n	n	2
Resource Area 1	n	n	55	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 2	n	n	22	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 4	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 5	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 6	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 7	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 8	n	n	n	n	n	5	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 9	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 10	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 11	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 12	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 13	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 14	n	n	n	n	n	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.

Table G-1. (Continued) -- Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain Resource Area within 3 days.

Target	E16	E17	E18	E19	E20	E21	E22	E23	E24
Land	n	n	2	5	5	14	n	7	n
Resource Area 1	n	n	n	n	n	n	n	n	n
Resource Area 2	n	n	n	n	n	n	n	n	n
Resource Area 3	n	n	n	n	n	n	n	n	n
Resource Area 4	n	n	n	n	n	n	n	n	n
Resource Area 5	n	n	n	n	n	n	n	n	n
Resource Area 6	n	n	n	n	n	n	n	n	n
Resource Area 7	n	n	n	n	n	n	n	n	n
Resource Area 8	n	n	n	n	n	n	n	n	**
Resource Area 9	n	n	n	n	n	n	n	n	n
Resource Area 10	n	n	n	n	n	n	n	n	7
Resource Area 11	n	n	n	n	n	n	n	n	n
Resource Area 12	n	n	n	n	n	n	n	n	n
Resource Area 13	n	n	n	n	n	n	n	n	n
Resource Area 14	n	n	n	n	n	n	n	n	n

(Column group heading: Hypothetical Spill Location)

Note: ** = Greater than 99.5 percent; n = less than 0.5 percent.

Table G-2. -- Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain Resource Area within 10 days.

Target	Hypothetical Spill Location																							
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	B1
Land	5	n	n	n	2	n	n	n	n	5	n	n	n	2	n	2	n	n	46	n	n	n	n	n	6
Resource Area 1	n	n	n	n	27	n	n	n	3	18	n	n	n	n	n	9	n	n	2	n	n	n	n	n	n
Resource Area 2	n	n	n	n	2	n	n	n	5	21	n	n	n	n	3	23	n	n	**	n	2	n	n	n	n
Resource Area 3	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n	n	n	n
Resource Area 4	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 5	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 6	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 7	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2
Resource Area 8	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 9	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 10	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 11	n	n	n	n	5	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n
Resource Area 12	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 13	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	8	**	n	n	n
Resource Area 14	n	n	n	n	n	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.

Table G-2. (Continued) -- Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain Resource Area within 10 days.

Target	Hypothetical Spill Location																							
	B2	B3	B15	D1	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20	P21
Land	11	14	n	25	n	n	n	n	n	24	n	n	n	n	n	n	7	7	32	22	n	n	n	n	4
Resource Area 1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	34	n	n
Resource Area 2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	5	n	n
Resource Area 3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	22	n	n	n	n	n
Resource Area 4	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 5	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 6	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 7	17	49	n	**	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 8	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	9	n
Resource Area 9	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 10	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	34	n
Resource Area 11	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	5	n	n
Resource Area 12	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 13	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 14	n	n	n	n	n	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.

Table G-2. (Continued) -- Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain Resource Area within 10 days.

Target	Hypothetical Spill Location																							
	P22	P23	P24	P25	P26	F1	F2	F3	F4	F5	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12	E13	E14
Land	n	n	2	n	n	n	5	2	n	5	2	5	2	n	2	5	4	2	33	n	4	12	9	24
Resource Area 1	n	n	62	7	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 2	n	n	35	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 4	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 5	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 6	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 7	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 8	n	n	n	n	n	5	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 9	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 10	n	n	n	n	n	7	n	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 11	n	n	n	13	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 12	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 13	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 14	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n

Note: n = less than 0.5 percent; ** = greater than 99.5 percent.

Table G-2. (Continued) -- Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain Resource Area within 10 days.

Target	Hypothetical Spill Location									
	E15	E16	E17	E18	E19	E20	E21	E22	E23	E24
Land	35	9	12	23	16	40	33	30	12	n
Resource Area 1	n	n	n	n	n	n	n	n	n	n
Resource Area 2	n	n	n	n	n	n	n	n	n	n
Resource Area 3	n	n	n	n	n	n	n	n	n	n
Resource Area 4	n	n	n	n	n	n	n	n	n	n
Resource Area 5	n	n	n	n	n	n	n	n	n	n
Resource Area 6	n	n	n	n	n	n	n	n	n	n
Resource Area 7	n	n	n	n	n	n	n	n	n	n
Resource Area 8	n	n	n	n	n	n	n	n	n	**
Resource Area 9	n	n	n	n	n	n	n	n	n	n
Resource Area 10	n	n	n	n	n	n	n	n	n	12
Resource Area 11	n	n	n	n	n	n	n	n	n	n
Resource Area 12	n	n	n	n	n	n	n	n	n	n
Resource Area 13	n	n	n	n	n	n	n	n	n	n
Resource Area 14	n	n	n	n	n	n	n	n	n	n

Note: n = less than 0.5 percent; ** = greater than 99.5 percent.

Table G-3. -- Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain Resource Area within 30 days.

Target	Hypothetical Spill Location																							
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	B1
Land	36	7	6	8	5	15	6	6	18	21	5	6	8	5	5	14	n	n	46	2	12	n	n	n	36
Resource Area 1	n	8	17	18	30	24	14	24	23	20	9	5	3	n	n	14	n	2	6	n	n	n	n	n	2
Resource Area 2	n	n	2	3	6	20	17	24	24	30	15	11	9	5	11	35	n	n	**	n	23	19	n	n	n
Resource Area 3	n	n	n	n	n	n	n	n	n	n	n	2	n	2	n	n	n	n	n	n	n	n	n	n	n
Resource Area 4	n	n	n	n	n	n	n	n	n	n	n	6	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 5	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 6	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 7	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	25
Resource Area 8	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2
Resource Area 9	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	19	n	n	n	n	n	n	n	n
Resource Area 10	20	3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	5
Resource Area 11	2	5	14	20	9	11	5	2	n	n	n	n	n	n	n	n	2	48	n	n	n	n	n	n	n
Resource Area 12	n	n	2	6	35	2	n	3	5	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 13	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	5	3	26	**	n	n	n
Resource Area 14	n	n	n	n	n	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.

Table G-3. (Continued) -- Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain Resource Area within 30 days.

Target	B2	B3	B15	D1	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20	P21
	Hypothetical Spill Location																								
Land	36	45	4	53	n	n	6	5	1	25	4	n	5	10	7	17	51	31	35	27	6	1	14	17	25
Resource Area 1	2	2	14	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	42	n	n
Resource Area 2	n	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	14	2	13	n	n
Resource Area 3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	25	n	n	n	n	n
Resource Area 4	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 5	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 6	2	25	n	4	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 7	33	49	n	**	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 8	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	15	n
Resource Area 9	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	24	n
Resource Area 10	2	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	51	n
Resource Area 11	n	n	6	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	19	15	n
Resource Area 12	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	4	19	n	n
Resource Area 13	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	10	2	n	n
Resource Area 14	n	n	n	n	n	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.

Table G-3. (Continued) -- Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain Resource Area within 30 days.

Target	Hypothetical Spill Location																							
	P22	P23	P24	P25	P26	F1	F2	F3	F4	F5	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12	E13	E14
Land	22	6	23	4	n	2	6	11	2	11	57	60	37	58	60	22	48	36	69	36	61	41	64	75
Resource Area 1	n	4	62	20	n	n	2	9	9	7	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 2	n	19	41	5	n	n	2	5	2	5	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 3	4	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 4	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 5	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 6	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 7	n	n	n	n	n	n	n	2	n	5	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 8	n	n	n	n	n	5	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 9	n	n	n	n	n	16	5	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 10	n	n	n	9	n	44	33	12	12	5	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 11	n	n	9	40	n	9	7	2	21	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 12	n	n	12	13	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 13	n	n	7	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Resource Area 14	n	n	n	n	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.

Table G-3. (Continued) -- Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain Resource Area within 30 days.

Target	Hypothetical Spill Location									
	E15	E16	E17	E18	E19	E20	E21	E22	E23	E24
Land	84	80	77	77	78	89	72	41	26	7
Resource Area 1	n	n	n	n	n	n	n	n	n	n
Resource Area 2	n	n	n	n	n	n	n	n	n	n
Resource Area 3	n	n	n	n	n	n	n	n	n	n
Resource Area 4	n	n	n	n	n	n	n	n	n	n
Resource Area 5	n	n	n	n	n	n	n	n	n	n
Resource Area 6	n	n	n	n	n	n	n	n	n	n
Resource Area 7	n	n	n	n	n	n	n	n	n	n
Resource Area 8	n	n	n	n	n	n	n	n	n	**
Resource Area 9	n	n	n	n	n	n	n	n	n	56
Resource Area 10	n	n	n	n	n	n	n	n	n	12
Resource Area 11	n	n	n	n	n	n	n	n	n	n
Resource Area 12	n	n	n	n	n	n	n	n	n	n
Resource Area 13	n	n	n	n	n	n	n	n	n	n
Resource Area 14	n	n	n	n	n	n	n	n	n	n

Note: ** = Greater than 99.5 percent; n = less than 0.5 percent.

Table G-4. -- Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain Sea Target within 3 days.

Target	Hypothetical Spill Location																								
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	B1
Sea Target 1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 4	12	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 5	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	3
Sea Target 6	n	2	16	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 7	n	n	n	2	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 8	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 9	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 10	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 11	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	9	n	n	n	n	n	n	n	n	n
Sea Target 12	n	n	n	n	n	n	n	2	17	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 13	n	n	n	n	n	n	20	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 14	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 15	n	n	n	n	n	n	n	n	n	n	n	20	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 16	n	n	n	n	n	n	n	n	n	n	n	n	8	3	n	n	n	n	n	n	n	n	n	n	n
Sea Target 17	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n	n	n
Sea Target 18	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	3	n	n	n	n	n
Sea Target 19	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 20	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 21	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 22	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 23	n	n	n	n	n	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.

Table G-4. (Continued) -- Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain Sea Target within 3 days.

Target	Hypothetical Spill Location																							
	B2	B3	B15	D1	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20	P21
Sea Target 1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 4	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 5	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 6	n	n	8	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 7	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 8	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 9	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 10	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 11	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 12	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 13	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 14	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 15	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 16	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 17	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 18	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	13	n	n	n	n
Sea Target 19	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 20	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 21	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 22	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 23	n	**	n	28	n	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.

Table G-4. (Continued) -- Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain Sea Target within 3 days.

Target	Hypothetical Spill Location																							
	P22	P23	P24	P25	P26	F1	F2	F3	F4	F5	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12	E13	E14
Sea Target 1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 3	n	n	n	n	n	23	2	n	5	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 4	n	n	n	n	n	n	n	n	n	5	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 5	n	n	n	n	n	n	n	n	n	13	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 6	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 7	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 8	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 9	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 10	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 11	n	n	5	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 12	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 13	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 14	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 15	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 16	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 17	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 18	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 19	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 20	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 21	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 22	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 23	n	n	n	n	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.

Table G-4. (Continued) -- Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain Sea Target within 3 days.

Target	Hypothetical Spill Location									
	E15	E16	E17	E18	E19	E20	E21	E22	E23	E24
Sea Target 1	n	n	n	n	n	n	n	n	n	n
Sea Target 2	n	n	n	n	n	n	n	n	n	n
Sea Target 3	n	n	n	n	n	n	n	n	n	n
Sea Target 4	n	n	n	n	n	n	n	n	n	n
Sea Target 5	n	n	n	n	n	n	n	n	n	n
Sea Target 6	n	n	n	n	n	n	n	n	n	n
Sea Target 7	n	n	n	n	n	n	n	n	n	n
Sea Target 8	n	n	n	n	n	n	n	n	n	n
Sea Target 9	n	n	n	n	n	n	n	n	n	n
Sea Target 10	n	n	n	n	n	n	n	n	n	n
Sea Target 11	n	n	n	n	n	n	n	n	n	n
Sea Target 12	n	n	n	n	n	n	n	n	n	n
Sea Target 13	n	n	n	n	n	n	n	n	n	n
Sea Target 14	n	n	n	n	n	n	n	n	n	n
Sea Target 15	n	n	n	n	n	n	n	n	n	n
Sea Target 16	n	n	n	n	n	n	n	n	n	n
Sea Target 17	n	n	n	n	n	n	n	n	n	n
Sea Target 18	n	n	n	n	n	n	n	n	n	n
Sea Target 19	n	n	n	n	n	n	n	n	n	n
Sea Target 20	n	n	n	n	n	n	n	n	n	n
Sea Target 21	n	n	n	n	n	n	n	n	n	n
Sea Target 22	n	n	n	n	n	n	n	n	n	n
Sea Target 23	n	n	n	n	n	n	n	n	n	n

Note: ** = Greater than 99.5 percent; n = less than 0.5 percent.

Table G-5. -- Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain Sea Target within 10 days.

Target	Hypothetical Spill Location																								
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	B1
Sea Target 1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	12	n	n	n	n	n	n	n
Sea Target 2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 3	15	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 4	33	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	9
Sea Target 5	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	3
Sea Target 6	2	12	20	2	n	4	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	3
Sea Target 7	n	n	2	8	2	20	2	5	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 8	n	n	n	n	6	n	n	n	2	3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 9	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 10	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	3	6	n	n	n	n
Sea Target 11	n	n	n	n	2	n	n	2	3	17	n	n	n	n	3	29	n	n	2	n	n	n	n	n	n
Sea Target 12	n	n	n	n	n	2	3	14	21	4	17	2	3	n	n	6	n	n	n	n	n	n	n	n	n
Sea Target 13	n	2	n	n	n	n	23	8	n	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 14	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 15	n	n	n	n	n	n	n	n	n	n	n	21	4	4	n	n	n	n	n	n	n	n	n	n	n
Sea Target 16	n	n	n	n	n	n	2	2	n	n	2	8	17	20	8	n	n	n	n	n	n	n	n	n	n
Sea Target 17	n	n	n	n	n	n	n	n	n	2	n	n	2	n	15	n	n	n	n	6	n	n	n	n	n
Sea Target 18	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	2	12	n	n	n	n	n
Sea Target 19	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 20	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 21	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 22	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 23	n	n	n	n	n	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.

Table G-5. (Continued) -- Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain Sea Target within 10 days.

Target	Hypothetical Spill Location																							
	B2	B3	B15	D1	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20	P21
Sea Target 1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n
Sea Target 3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	4	n
Sea Target 4	3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 5	8	6	6	3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 6	2	n	26	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 7	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	5	n	n
Sea Target 8	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	14	n	n
Sea Target 9	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 10	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	4	n	n	n
Sea Target 11	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	5	n	n
Sea Target 12	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 13	n	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 14	2	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 15	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 16	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 17	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 18	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	32	2	n	n	n
Sea Target 19	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 20	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 21	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 22	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 23	10	**	n	32	n	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.

Table G-5. (Continued) -- Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain Sea Target within 10 days.

Target	P22	P23	P24	P25	P26	F1	F2	F3	F4	F5	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12	E13	E14
	Hypothetical Spill Location																							
Sea Target 1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 2	n	n	n	6	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 3	n	n	n	n	n	23	23	9	7	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 4	n	n	n	n	n	n	2	3	n	5	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 5	n	n	n	n	n	n	n	2	n	18	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 6	n	n	n	n	n	n	n	2	2	7	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 7	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 8	n	n	5	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 9	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 10	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 11	n	n	5	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 12	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 13	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 14	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 15	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 16	n	5	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 17	n	21	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 18	n	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 19	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 20	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 21	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 22	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 23	n	n	n	n	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.

Table G-5. (Continued) -- Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain Sea Target within 10 days.

Target	Hypothetical Spill Location									
	E15	E16	E17	E18	E19	E20	E21	E22	E23	E24
Sea Target 1	n	n	n	n	n	n	n	n	n	n
Sea Target 2	n	n	n	n	n	n	n	n	n	n
Sea Target 3	n	n	n	n	n	n	n	n	n	n
Sea Target 4	n	n	n	n	n	n	n	n	n	n
Sea Target 5	n	n	n	n	n	n	n	n	n	n
Sea Target 6	n	n	n	n	n	n	n	n	n	n
Sea Target 7	n	n	n	n	n	n	n	n	n	n
Sea Target 8	n	n	n	n	n	n	n	n	n	n
Sea Target 9	n	n	n	n	n	n	n	n	n	n
Sea Target 10	n	n	n	n	n	n	n	n	n	n
Sea Target 11	n	n	n	n	n	n	n	n	n	n
Sea Target 12	n	n	n	n	n	n	n	n	n	n
Sea Target 13	n	n	n	n	n	n	n	n	n	n
Sea Target 14	n	n	n	n	n	n	n	n	n	n
Sea Target 15	n	n	n	n	n	n	n	n	n	n
Sea Target 16	n	n	n	n	n	n	n	n	n	n
Sea Target 17	n	n	n	n	n	n	n	n	n	n
Sea Target 18	n	n	n	n	n	n	n	n	n	n
Sea Target 19	n	n	n	n	n	n	n	n	n	n
Sea Target 20	n	n	n	n	n	n	n	n	n	n
Sea Target 21	n	n	n	n	n	n	n	n	n	n
Sea Target 22	n	n	n	n	n	n	n	n	n	n
Sea Target 23	n	n	n	n	n	n	n	n	n	n

Note: ** = Greater than 99.5 percent; n = less than 0.5 percent.

Table G-6. -- Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain Sea Target within 30 days.

Target	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	B1
	Hypothetical Spill Location																								
Sea Target 1	n	n	2	9	n	5	n	n	n	n	n	n	n	n	n	n	n	21	n	n	n	n	n	n	n
Sea Target 2	3	5	9	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	5
Sea Target 3	17	2	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	11
Sea Target 4	33	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	9
Sea Target 5	4	19	4	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	3
Sea Target 6	2	14	20	19	n	12	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	9
Sea Target 7	3	12	6	8	15	20	6	6	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 8	n	5	9	8	6	14	3	6	5	5	2	2	n	n	n	n	n	2	n	n	n	n	n	n	n
Sea Target 9	n	n	n	n	3	2	n	n	3	9	2	n	2	n	2	2	n	n	n	n	n	n	n	n	n
Sea Target 10	n	n	n	n	n	2	n	9	2	n	3	n	3	5	6	8	n	n	2	3	21	10	2	n	n
Sea Target 11	n	n	n	2	2	5	6	14	12	18	11	2	9	n	3	29	n	n	17	n	n	n	n	n	n
Sea Target 12	2	3	n	n	2	2	11	15	21	23	17	3	3	n	n	19	n	n	n	n	n	n	n	n	2
Sea Target 13	n	2	n	n	n	8	23	21	10	2	8	n	n	n	2	n	n	n	n	n	n	n	n	n	2
Sea Target 14	n	2	n	n	n	n	10	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 15	n	n	n	n	n	n	n	n	n	n	6	21	23	4	2	n	n	n	n	n	n	n	n	n	n
Sea Target 16	n	2	2	n	n	n	2	2	n	n	2	14	18	21	19	2	n	n	n	n	n	n	n	n	2
Sea Target 17	n	n	n	2	n	2	5	5	n	2	11	12	15	11	17	n	n	n	2	23	n	n	n	n	n
Sea Target 18	n	n	n	n	n	n	n	n	5	2	5	9	11	2	14	3	n	n	2	14	2	n	2	4	n
Sea Target 19	n	n	n	n	n	n	n	n	n	n	n	12	2	4	n	n	n	n	n	n	n	n	n	n	n
Sea Target 20	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 21	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2
Sea Target 22	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 23	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	13

Note: ** = Greater than 99.5 percent; n = less than 0.5 percent.

Table G-6. (Continued) -- Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain Sea Target within 30 days.

Target	B2	B3	B15	D1	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20	P21
	Hypothetical Spill Location																								
Sea Target 1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	9	7	n
Sea Target 2	n	n	6	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	6	5	n
Sea Target 3	5	2	n	3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	13	n
Sea Target 4	8	2	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 5	8	12	19	5	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 6	5	6	27	8	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 7	3	3	11	3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	6	n	n
Sea Target 8	n	2	6	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	20	n	n
Sea Target 9	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	5	5	n	n
Sea Target 10	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	4	4	5	n	n
Sea Target 11	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	5	n	n
Sea Target 12	n	n	5	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 13	3	3	2	3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 14	2	2	4	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 15	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 16	2	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 17	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	4	4	1	n	n	n
Sea Target 18	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	35	5	2	n	n
Sea Target 19	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 20	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 21	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 22	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 23	12	**	n	32	n	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.

Table G-6. (Continued) -- Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain Sea Target within 30 days.

Target	Hypothetical Spill Location																						
	P22	P23	P24	P25	P26	F1	F2	F3	F4	F5	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12	E13	E14
Sea Target 1	n	n	1	7	n	2	n	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 2	n	n	n	14	n	5	9	19	21	7	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 3	n	n	n	n	n	26	23	14	7	5	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 4	n	n	n	n	n	5	3	3	n	5	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 5	n	n	n	n	n	n	8	5	10	19	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 6	n	n	n	2	n	n	n	2	2	9	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 7	n	1	n	n	n	n	2	5	2	5	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 8	n	n	9	5	n	n	2	2	7	5	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 9	n	2	n	5	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 10	n	4	5	5	n	n	n	2	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 11	n	2	6	n	n	n	2	n	n	5	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 12	n	1	4	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 13	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 14	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 15	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 16	n	10	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 17	n	24	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 18	n	15	5	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 19	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 20	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 21	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 22	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Target 23	n	n	n	n	n	n	n	n	n	2	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.

Table G-6. (Continued) -- Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain Sea Target within 30 days.

Target	Hypothetical Spill Location									
	E15	E16	E17	E18	E19	E20	E21	E22	E23	E24
Sea Target 1	n	n	n	n	n	n	n	n	n	n
Sea Target 2	n	n	n	n	n	n	n	n	n	n
Sea Target 3	n	n	n	n	n	n	n	n	n	5
Sea Target 4	n	n	n	n	n	n	n	n	n	n
Sea Target 5	n	n	n	n	n	n	n	n	n	n
Sea Target 6	n	n	n	n	n	n	n	n	n	n
Sea Target 7	n	n	n	n	n	n	n	n	n	n
Sea Target 8	n	n	n	n	n	n	n	n	n	n
Sea Target 9	n	n	n	n	n	n	n	n	n	n
Sea Target 10	n	n	n	n	n	n	n	n	n	n
Sea Target 11	n	n	n	n	n	n	n	n	n	n
Sea Target 12	n	n	n	n	n	n	n	n	n	n
Sea Target 13	n	n	n	n	n	n	n	n	n	n
Sea Target 14	n	n	n	n	n	n	n	n	n	n
Sea Target 15	n	n	n	n	n	n	n	n	n	n
Sea Target 16	n	n	n	n	n	n	n	n	n	n
Sea Target 17	n	n	n	n	n	n	n	n	n	n
Sea Target 18	n	n	n	n	n	n	n	n	n	n
Sea Target 19	n	n	n	n	n	n	n	n	n	n
Sea Target 20	n	n	n	n	n	n	n	n	n	n
Sea Target 21	n	n	n	n	n	n	n	n	n	n
Sea Target 22	n	n	n	n	n	n	n	n	n	n
Sea Target 23	n	n	n	n	n	n	n	n	n	n

Note: ** = Greater than 99.5 percent; n = less than 0.5 percent.

Table G-7. -- Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain land or boundary segment witnin 3 days.

Segment	Hypothetical Spill Location																								
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	B1
146	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	46	n	n	n	n	n	n

Table G-7. -- Probabilities (expressed as percent chance) that an oil spill starting at a (Continued) particular location will contact a certain land or boundary segment within 3 days.

Segment	Hypothetical Spill Location																								
	B2	B3	B15	D1	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20	P21
11	n	3	n	19	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
12	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
33	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n
34	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n
145	n	n	n	n	n	n	n	n	n	4	n	n	n	n	n	n	n	n	14	n	n	n	n	n	n

Table G-7. (Continued) -- Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain land or boundary segment within 3 days.

Segment	Hypothetical Spill Location									
	P22	P23	P24	P25	P26	F1	F2	F3	F4	F5
7	n	n	n	n	n	n	5	n	n	n
8	n	n	n	n	n	n	n	2	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 G-7. (Continued)

Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain land segment within 3 days.

Land Segment	Hypothetical Spill Location																							
	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12	E13	E14	E15	E16	E17	E18	E19	E20	E21	E22	E23	E24
40	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n	n	n	n	n
42	n	n	2	n	n	3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
52	n	n	n	n	n	n	n	n	25	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
57	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n
59	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	2	n	14	n	n	n
61	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n
62	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	2	n	n	n	n	n
107	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n
113	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	5	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 G-8. -- Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain land or boundary segment within 10 days.

Segment	Hypothetical Spill Location																							
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	B1
7	3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
8	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
10	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	4
11	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2
33	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n	n	n	n
146	n	n	n	n	n	n	n	n	n	5	n	n	n	n	n	n	n	n	46	n	n	n	n	n	n
147	n	n	n	n	2	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n	n

Table G-8. -- (Continued) Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain land or boundary segment within 10 days.

Segment	Hypothetical Spill Location																							
	B2	B3	B15	D1	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20	P21
10	2	n	n	3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
11	10	11	n	19	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
12	n	3	n	4	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
33	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	11	n	n	n	n	n
34	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	11	n	n	n	n	n
50	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	4
52	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	5	n	n	n	n	n	n	n
53	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n
55	n	n	n	n	n	n	n	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
106	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n
107	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n
109	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n
144	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
145	n	n	n	n	n	n	n	n	n	20	n	n	n	n	n	n	n	n	32	n	n	n	n	n	n

Note: ** = Greater than 99.5 percent; n = less than 0.5 percent.
Rows with all values less than 0.5 percent are not shown.

Table G-8. (Continued) -- Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain land or boundary segment within 10 days.

Segment	Hypothetical Spill Location									
	P22	P23	P24	P25	P26	F1	F2	F3	F4	F5
7	n	n	n	n	n	n	5	n	n	n
8	n	n	n	n	n	n	n	2	n	5
147	n	n	2	n	n	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 G-8. (Continued)

Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain land segment within 10 days.

Land Segment	Hypothetical Spill Location																							
	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12	E13	E14	E15	E16	E17	E18	E19	E20	E21	E22	E23	E24
40	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n	n	n	n	n
42	n	2	2	n	n	5	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
43	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
48	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
52	n	n	n	n	2	n	2	n	33	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
53	n	n	n	n	n	n	n	n	n	n	2	n	n	15	n	n	n	n	n	n	n	n	n	n
55	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n
56	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	10	n	n
57	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	20	2	n
58	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	5	2	n	5	n	n	n
59	n	n	n	n	n	n	n	n	n	n	2	2	n	2	2	5	7	7	5	2	26	n	n	n
60	n	n	n	n	n	n	n	2	n	n	n	7	9	5	n	n	5	5	n	n	n	n	n	n
61	n	n	n	n	n	n	n	n	n	n	n	n	n	2	10	n	n	n	n	2	n	n	n	n
62	n	n	n	n	n	n	n	n	n	n	n	n	n	n	18	n	n	n	2	n	n	n	n	n
64	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	8	n	n	n	n
65	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n
106	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n
107	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	12	n	n	n	n
108	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	5	n	n	n	n
110	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	2	n	n	n	n
112	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	5	5	5	n	n	n	n
113	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	2	n	9	n
148	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	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 G-9. -- Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain land or boundary segment within 30 days.

Segment	Hypothetical Spill Location																							
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	B1
6	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2
7	8	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	3
8	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2
9	12	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2
10	13	4	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	6
11	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	19
12	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	4
28	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n	n	n	n
29	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n
33	n	n	n	n	n	n	n	n	n	n	n	2	n	2	n	n	n	n	n	n	n	n	n	n	n
144	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
145	n	n	n	2	n	2	n	n	2	n	n	n	n	n	2	2	n	n	n	2	n	n	n	n	n
146	n	n	n	2	2	9	3	2	9	15	3	2	6	2	3	8	n	n	46	n	12	n	n	n	n
147	n	3	6	5	3	5	3	3	8	6	2	2	2	n	n	5	n	n	n	n	n	n	n	n	n
173	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n
174	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n
175	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	3	n	n	n	n	n	n	n	n
176	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	3	n	n	n	n	n	n	n	n
177	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	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 G-9. (Continued) -- Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain land or boundary segment within 30 days.

Segment	Hypothetical Spill Location																							
	B2	B3	B15	D1	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20	P21
3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n
5	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n
6	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	5	n
7	2	n	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	7	n
8	5	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
9	n	2	n	3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
10	2	3	4	3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
11	19	11	n	19	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
12	6	3	n	6	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
13	4	19	n	19	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
14	n	8	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
33	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	11	n	n	n	n	n
34	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	11	n	n	n	n	n
41	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2
42	n	n	n	n	n	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	n	n	n	n	n	1
49	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1
50	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	n	n	n	n	n	16
51	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	9	n	n	n	n	n	n	n
52	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	7	n	n	n	n	n	n	n
53	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n
54	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n	n
55	n	n	n	n	n	n	n	n	1	1	1	n	n	n	n	n	n	1	n	n	n	n	n	n	n
56	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	4	n	5	n	n	n	n	n	n	n
57	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	6	n	n	n	n	n	n	n	n	n
58	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	n	n	n	n	n	n	n	n
59	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	n	n	n	n	n	n	n	n
61	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	n	n	n	n	n	n	n
62	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	n	n	n	n	n	n	n
63	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	14	n	n	n	n	n	n	n	n
64	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n
65	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n
106	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n
107	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n
109	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n
110	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	5	n	n	n	n	n	n	n
111	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	7	n	n	n	n	n	n	n	n
112	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	5	n	n	n	n	n	n	n	n
113	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	9	n	n	n	n	n	n	n	n
127	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n	n
131	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n	n	n
132	n	n	n	n	n	n	n	n	n	n	n	n	5	7	5	n	n	n	n	n	n	n	n	n	n
133	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n	n	n	n
144	n	n	n	n	n	n	n	1	n	2	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n
145	n	n	n	n	n	n	6	4	n	21	n	n	n	n	n	n	n	n	35	5	n	n	n	n	n
146	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	5	1	5	n	n
147	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	9	n	n
181	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	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 G-9. (Continued) -- Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain land or boundary segment within 30 days.

Segment	Hypothetical Spill Location									
	P22	P23	P24	P25	P26	F1	F2	F3	F4	F5
7	n	n	n	n	n	n	5	2	n	n
8	n	n	n	n	n	n	n	2	n	5
9	n	n	n	n	n	2	n	n	n	n
10	n	n	n	n	n	n	2	2	2	n
11	n	n	n	n	n	n	n	5	n	3
12	n	n	n	n	n	n	n	n	n	3
34	1	n	n	n	n	n	n	n	n	n
39	4	n	n	n	n	n	n	n	n	n
40	6	n	n	n	n	n	n	n	n	n
41	4	n	n	n	n	n	n	n	n	n
56	2	n	n	n	n	n	n	n	n	n
59	5	n	n	n	n	n	n	n	n	n
146	n	6	11	2	n	n	n	n	n	n
147	n	n	12	2	n	n	n	n	n	n
162	n	n	n	n	2	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 G-9. (Continued)

Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain land segment within 30 days.

Land Segment	Hypothetical Spill Location																						
	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12	E13	E14	E15	E16	E17	E18	E19	E20	E21	E22	E23	E24
6	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	5
7	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2
38	n	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
40	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n	n	n	n	n
42	n	16	5	n	n	5	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
43	n	16	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
44	n	7	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
45	n	15	5	n	n	3	n	n	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n
47	3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
48	27	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
49	3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
50	n	3	n	18	5	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
51	n	n	5	7	15	2	8	2	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
52	2	n	2	n	7	n	3	8	42	5	22	8	5	8	n	2	3	n	n	n	n	n	n	n
53	n	n	n	n	n	n	n	n	n	2	2	5	20	23	n	10	15	5	n	n	5	n	n	n
54	2	n	2	n	n	n	n	n	n	n	n	n	2	n	n	n	2	n	n	n	n	n	n	n
55	n	n	2	2	2	2	5	n	n	5	n	n	2	2	n	2	n	2	n	n	n	2	n	n
56	n	n	n	n	2	n	2	n	n	n	2	5	n	n	n	n	n	n	n	n	n	10	n	n
57	n	n	n	2	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n	n	20	2	n
58	n	n	n	n	2	n	2	n	n	2	2	n	2	n	2	5	2	7	2	n	9	n	n	n
59	5	n	5	12	9	n	7	7	12	9	16	7	12	9	5	9	14	7	5	2	26	n	n	n
60	12	2	9	14	16	9	14	16	9	12	9	7	14	12	5	5	5	5	5	n	n	n	n	n
61	n	n	n	n	n	n	n	n	n	n	n	n	n	3	23	20	17	12	12	2	8	n	n	n
62	n	n	n	n	n	n	n	n	n	n	n	n	2	n	18	7	3	15	12	n	8	n	n	n
63	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	2	n	n	n	2	n
64	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	7	8	8	7	n	n	n
65	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	5	10	2	n	n	n
66	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n
68	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	3	n	n	n	n
75	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	3	n	n	n	n
76	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	8	n	n	n	n
105	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n
106	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n
107	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	12	n	n	2	n
108	n	n	n	n	n	n	n	n	n	n	n	n	n	n	7	n	n	n	n	9	n	n	n	n
109	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
110	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	5	n	n	5	5	n	n	n	n
111	n	n	n	n	n	n	n	n	n	n	n	n	n	2	2	2	2	2	5	5	n	n	n	n
112	n	n	n	2	n	n	2	n	5	n	5	n	2	7	14	7	7	9	9	9	n	n	n	n
113	n	n	n	n	n	n	n	2	n	n	2	n	2	7	2	5	2	2	7	7	5	n	9	n
114	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n	2	n	n	n

Table G-9. (Continued)

Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain land segment within 30 days.

Land Segment	Hypothetical Spill Location																							
	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12	E13	E14	E15	E16	E17	E18	E19	E20	E21	E22	E23	E24
116	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n
117	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n
128	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n
130	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	7	2	n
131	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	5	n
144	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n	n	n	n	n
148	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	2	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 G-10. -- Probabilities (expressed as percent chance) of one or more spills, and the estimated number of spills (mean) occurring and contacting land or biological resource areas over the expected production life of the lease area, for port and at-sea spills of 1,000 barrels and greater.

Target	Within 3 days						Within 10 days						Within 30 days					
	PROPOSAL PIPELINE TRANSP.		CUMUL-ATIVE CASE		PROPOSAL OFFSHORE LOADING		PROPOSAL PIPELINE TRANSP.		CUMUL-ATIVE CASE		PROPOSAL OFFSHORE LOADING		PROPOSAL PIPELINE TRANSP.		CUMUL-ATIVE CASE		PROPOSAL OFFSHORE LOADING	
	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean
Land	3	0.0	86	2.0	4	0.0	8	0.1	96	3.2	9	0.1	23	0.3	**	5.5	27	0.3
Resource Area 1	n	0.0	49	0.7	n	0.0	n	0.0	71	1.2	n	0.0	4	0.0	81	1.7	4	0.0
Resource Area 2	n	0.0	31	0.4	n	0.0	n	0.0	45	0.6	n	0.0	1	0.0	63	1.0	1	0.0
Resource Area 3	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0	n	0.0	1	0.0	n	0.0
Resource Area 4	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
Resource Area 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
Resource Area 6	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	5	0.1	5	0.1	6	0.1
Resource Area 7	17	0.2	17	0.2	19	0.2	20	0.2	20	0.2	23	0.3	24	0.3	24	0.3	27	0.3
Resource Area 8	n	0.0	37	0.5	2	0.0	n	0.0	41	0.5	2	0.0	n	0.0	44	0.6	3	0.0
Resource Area 9	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	38	0.5	2	0.0
Resource Area 10	n	0.0	3	0.0	n	0.0	n	0.0	25	0.3	1	0.0	5	0.1	42	0.5	8	0.1
Resource Area 11	n	0.0	n	0.0	n	0.0	n	0.0	16	0.2	n	0.0	3	0.0	61	1.0	3	0.0
Resource Area 12	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	50	0.7	n	0.0
Resource Area 13	n	0.0	3	0.0	n	0.0	n	0.0	3	0.0	n	0.0	n	0.0	13	0.1	n	0.0
Resource Area 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

Note: n = less than 0.5 percent; ** = greater than 99.5 percent.

Table G-11. -- Probabilities (expressed as percent chance) of one or more spills, and the estimated number of spills (mean) occurring and contacting land or biological resource areas over the expected production life of the lease area, for port and at-sea spills of 100,000 barrels and greater.

Target	------- Within 3 days ---------						------- Within 10 days --------						------- Within 30 days --------					
	PROPOSAL PIPELINE TRANSP.		CUMUL-ATIVE CASE		PROPOSAL OFFSHORE LOADING		PROPOSAL PIPELINE TRANSP.		CUMUL-ATIVE CASE		PROPOSAL OFFSHORE LOADING		PROPOSAL PIPELINE TRANSP.		CUMUL-ATIVE CASE		PROPOSAL OFFSHORE LOADING	
	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean
Land	n	0.0	27	0.3	n	0.0	n	0.0	31	0.4	1	0.0	1	0.0	42	0.5	2	0.0
Resource Area 1	n	0.0	8	0.1	n	0.0	n	0.0	13	0.1	n	0.0	n	0.0	16	0.2	n	0.0
Resource Area 2	n	0.0	3	0.0	n	0.0	n	0.0	5	0.0	n	0.0	n	0.0	8	0.1	n	0.0
Resource Area 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
Resource Area 4	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
Resource Area 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
Resource Area 6	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
Resource Area 7	1	0.0	1	0.0	1	0.0	1	0.0	1	0.0	2	0.0	1	0.0	1	0.0	2	0.0
Resource Area 8	n	0.0	9	0.1	n	0.0	n	0.0	10	0.1	n	0.0	n	0.0	11	0.1	n	0.0
Resource Area 9	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	8	0.1	n	0.0
Resource Area 10	n	0.0	1	0.0	n	0.0	n	0.0	5	0.0	n	0.0	n	0.0	8	0.1	1	0.0
Resource Area 11	n	0.0	n	0.0	n	0.0	n	0.0	2	0.0	n	0.0	n	0.0	9	0.1	n	0.0
Resource Area 12	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	6	0.1	n	0.0
Resource Area 13	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
Resource Area 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

Note: n = less than 0.5 percent; ** = greater than 99.5 percent.

Table G-12. -- Probabilities (expressed as percent chance) of one or more spills, and the estimated number of spills (mean) occurring and contacting sea targets over the expected production life of the lease area, for spills of 1,000 barrels and greater.

Target	------- Within 3 days ---------						------- Within 10 days --------						------- Within 30 days --------					
	PROPOSAL PIPELINE TRANSP.		CUMUL-ATIVE CASE		PROPOSAL OFFSHORE LOADING		PROPOSAL PIPELINE TRANSP.		CUMUL-ATIVE CASE		PROPOSAL OFFSHORE LOADING		PROPOSAL PIPELINE TRANSP.		CUMUL-ATIVE CASE		PROPOSAL OFFSHORE LOADING	
	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean
Sea Target 1	n	0.0	n	0.0	n	0.0	n	0.0	2	0.0	n	0.0	n	0.0	25	0.3	n	0.0
Sea Target 2	n	0.0	n	0.0	n	0.0	n	0.0	6	0.1	n	0.0	5	0.1	21	0.2	5	0.0
Sea Target 3	1	0.0	1	0.0	1	0.0	3	0.0	6	0.1	4	0.0	6	0.1	17	0.2	6	0.1
Sea Target 4	1	0.0	1	0.0	1	0.0	3	0.0	3	0.0	4	0.0	4	0.0	4	0.0	5	0.1
Sea Target 5	1	0.0	1	0.0	1	0.0	4	0.0	4	0.0	4	0.0	8	0.1	8	0.1	9	0.1
Sea Target 6	1	0.0	1	0.0	1	0.0	4	0.0	5	0.1	4	0.0	7	0.1	21	0.2	7	0.1
Sea Target 7	n	0.0	1	0.0	n	0.0	n	0.0	12	0.1	n	0.0	4	0.0	26	0.3	4	0.0
Sea Target 8	n	0.0	n	0.0	n	0.0	n	0.0	18	0.2	n	0.0	2	0.0	34	0.4	2	0.0
Sea Target 9	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	12	0.1	n	0.0
Sea Target 10	n	0.0	n	0.0	n	0.0	n	0.0	2	0.0	n	0.0	n	0.0	17	0.2	n	0.0
Sea Target 11	n	0.0	5	0.1	n	0.0	n	0.0	15	0.2	n	0.0	n	0.0	23	0.3	n	0.0
Sea Target 12	n	0.0	2	0.0	n	0.0	n	0.0	5	0.1	n	0.0	1	0.0	16	0.2	1	0.0
Sea Target 13	n	0.0	1	0.0	n	0.0	n	0.0	2	0.0	n	0.0	2	0.0	7	0.1	2	0.0
Sea Target 14	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	1	0.0	1	0.0	1	0.0
Sea Target 15	n	0.0	1	0.0	n	0.0	n	0.0	1	0.0	n	0.0	n	0.0	2	0.0	n	0.0
Sea Target 16	n	0.0	n	0.0	n	0.0	n	0.0	3	0.0	n	0.0	1	0.0	5	0.1	1	0.0
Sea Target 17	n	0.0	n	0.0	n	0.0	n	0.0	5	0.0	n	0.0	n	0.0	15	0.2	n	0.0
Sea Target 18	n	0.0	5	0.0	n	0.0	n	0.0	15	0.2	n	0.0	n	0.0	23	0.3	n	0.0
Sea Target 19	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
Sea Target 20	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
Sea Target 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
Sea Target 22	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
Sea Target 23	20	0.2	20	0.2	23	0.3	22	0.2	22	0.2	24	0.3	23	0.3	23	0.3	25	0.3

Note: n = less than 0.5 percent; ** = greater than 99.5 percent.

Table G-13. -- Probabilities (expressed as percent chance) of one or more spills, and the estimated number of spills (mean) occurring and contacting sea targets over the expected production life of the lease area, for spills of 100,000 barrels and greater.

Target	Within 3 days						Within 10 days						Within 30 days					
	PROPOSAL PIPELINE TRANSP.		CUMUL-ATIVE CASE		PROPOSAL OFFSHORE LOADING		PROPOSAL PIPELINE TRANSP.		CUMUL-ATIVE CASE		PROPOSAL OFFSHORE LOADING		PROPOSAL PIPELINE TRANSP.		CUMUL-ATIVE CASE		PROPOSAL OFFSHORE LOADING	
	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean
Sea Target 1	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	3	0.0	n	0.0
Sea Target 2	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0	n	0.0	3	0.0	n	0.0
Sea Target 3	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0	n	0.0	2	0.0	1	0.0
Sea Target 4	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
Sea Target 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
Sea Target 6	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
Sea Target 7	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0	n	0.0	2	0.0	n	0.0
Sea Target 8	n	0.0	n	0.0	n	0.0	n	0.0	2	0.0	n	0.0	n	0.0	4	0.0	n	0.0
Sea Target 9	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
Sea Target 10	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	2	0.0	n	0.0
Sea Target 11	n	0.0	1	0.0	n	0.0	n	0.0	1	0.0	n	0.0	n	0.0	2	0.0	n	0.0
Sea Target 12	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
Sea Target 13	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
Sea Target 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
Sea Target 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
Sea Target 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
Sea Target 17	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0	n	0.0	2	0.0	n	0.0
Sea Target 18	n	0.0	1	0.0	n	0.0	n	0.0	3	0.0	n	0.0	n	0.0	4	0.0	n	0.0
Sea Target 19	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
Sea Target 20	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
Sea Target 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
Sea Target 22	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
Sea Target 23	1	0.0	1	0.0	1	0.0	1	0.0	1	0.0	2	0.0	1	0.0	1	0.0	2	0.0

Note: n = less than 0.5 percent; ** = greater than 99.5 percent.

Table G-14. -- Probabilities (expressed as percent chance) of one or more spills, and the estimated number of spills (mean) occurring and contacting land/boundary segments over the expected production life of the lease area, for spills of 1,000 barrels and greater.

Land Segment	------- Within 3 days ---------						------- Within 10 days --------						------- Within 30 days --------					
	PROPOSAL PIPELINE TRANSP.		CUMUL-ATIVE CASE		PROPOSAL OFFSHORE LOADING		PROPOSAL PIPELINE TRANSP.		CUMUL-ATIVE CASE		PROPOSAL OFFSHORE LOADING		PROPOSAL PIPELINE TRANSP.		CUMUL-ATIVE CASE		PROPOSAL OFFSHORE LOADING	
	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean
3	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	2	0.0	n	0.0
5	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	2	0.0	n	0.0
6	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	6	0.1	n	0.0
7	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	7	0.1	1	0.0
8	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	1	0.0	1	0.0
9	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	1	0.0	1	0.0
10	n	0.0	n	0.0	n	0.0	1	0.0	1	0.0	1	0.0	3	0.0	3	0.0	4	0.0
11	2	0.0	2	0.0	3	0.0	5	0.1	5	0.1	6	0.1	9	0.1	9	0.1	10	0.1
12	n	0.0	n	0.0	n	0.0	1	0.0	1	0.0	1	0.0	3	0.0	3	0.0	3	0.0
13	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	7	0.1	7	0.1	8	0.1
14	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	2	0.0	2	0.0	2	0.0
42	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0	n	0.0	1	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	1	0.0	n	0.0
50	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	5	0.1	n	0.0
51	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	9	0.1	n	0.0
52	n	0.0	23	0.3	n	0.0	n	0.0	26	0.3	n	0.0	n	0.0	35	0.5	n	0.0
53	n	0.0	n	0.0	n	0.0	n	0.0	2	0.0	n	0.0	n	0.0	4	0.0	n	0.0
54	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
55	n	0.0	n	0.0	n	0.0	n	0.0	4	0.0	n	0.0	n	0.0	10	0.1	n	0.0
56	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0	n	0.0	3	0.0	n	0.0
57	n	0.0	n	0.0	n	0.0	n	0.0	2	0.0	n	0.0	n	0.0	3	0.0	n	0.0
58	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	2	0.0	n	0.0
59	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0	n	0.0	18	0.2	n	0.0
60	n	0.0	n	0.0	n	0.0	n	0.0	2	0.0	n	0.0	n	0.0	21	0.2	n	0.0
61	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
63	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
64	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0	n	0.0	1	0.0	n	0.0
65	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
66	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
76	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
103	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	2	0.0	n	0.0
104	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
106	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
107	n	0.0	1	0.0	n	0.0	n	0.0	2	0.0	n	0.0	n	0.0	2	0.0	n	0.0
108	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
110	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
111	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
112	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	6	0.1	n	0.0

Table G-14. -- Probabilities (expressed as percent chance) of one or more spills, and the estimated number of spills (mean)
(continued) occurring and contacting land/boundary segments over the expected production life of the lease area, for spills of 1,000 barrels and greater.

Land Segment	------- Within 3 days ---------						------- Within 10 days --------						------- Within 30 days --------					
	PROPOSAL PIPELINE TRANSP.		CUMUL- ATIVE CASE		PROPOSAL OFFSHORE LOADING		PROPOSAL PIPELINE TRANSP.		CUMUL- ATIVE CASE		PROPOSAL OFFSHORE LOADING		PROPOSAL PIPELINE TRANSP.		CUMUL- ATIVE CASE		PROPOSAL OFFSHORE LOADING	
	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean
113	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0	n	0.0	4	0.0	n	0.0
130	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
131	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	3	0.0	n	0.0
132	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	15	0.2	n	0.0
133	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	2	0.0	n	0.0
144	n	0.0	n	0.0	n	0.0	n	0.0	7	0.1	n	0.0	n	0.0	11	0.1	n	0.0
145	n	0.0	53	0.7	n	0.0	n	0.0	82	1.7	n	0.0	n	0.0	84	1.8	n	0.0
146	n	0.0	8	0.1	n	0.0	n	0.0	9	0.1	n	0.0	n	0.0	28	0.3	n	0.0
147	n	0.0	16	0.2	n	0.0	n	0.0	19	0.2	n	0.0	1	0.0	35	0.4	1	0.0
181	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	2	0.0	n	0.0
190	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
191	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
192	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	2	0.0	n	0.0
193	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
196	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	2	0.0	n	0.0
197	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	2	0.0	n	0.0
198	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	2	0.0	n	0.0
199	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	2	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 G-15. -- Probabilities (expressed as percent chance) of one or more spills, and the estimated number of spills (mean) occurring and contacting land/boundary segments over the expected production life of the lease area, for spills of 100,000 barrels and greater.

Land Segment	Within 3 days: PROPOSAL PIPELINE TRANSP. Prob	Mean	CUMUL-ATIVE CASE Prob	Mean	PROPOSAL OFFSHORE LOADING Prob	Mean	Within 10 days: PROPOSAL PIPELINE TRANSP. Prob	Mean	CUMUL-ATIVE CASE Prob	Mean	PROPOSAL OFFSHORE LOADING Prob	Mean	Within 30 days: PROPOSAL PIPELINE TRANSP. Prob	Mean	CUMUL-ATIVE CASE Prob	Mean	PROPOSAL OFFSHORE LOADING Prob	Mean
6	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
7	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
11	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
13	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
52	n	0.0	4	0.0	n	0.0	n	0.0	4	0.0	n	0.0	n	0.0	4	0.0	n	0.0
59	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
60	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
132	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
144	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
145	n	0.0	8	0.1	n	0.0	n	0.0	13	0.1	n	0.0	n	0.0	13	0.1	n	0.0
146	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	3	0.0	n	0.0
147	n	0.0	3	0.0	n	0.0	n	0.0	3	0.0	n	0.0	n	0.0	6	0.1	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 G-16. -- Probabilities (expressed as percent chance) of one or more spills, and the estimated number of spills (mean) occurring and contacting targets over the expected production life of the lease area, pipeline transportation scenario, for spills of 1,000 barrels and greater.

Target	------- Within 3 days ---------				------- Within 10 days --------				------- Within 30 days --------			
	PROPOSAL		DEFERRAL ALTERN. IV		PROPOSAL		DEFERRAL ALTERN. IV		PROPOSAL		DEFERRAL ALTERN. IV	
	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean
Land	3	0.0	3	0.0	8	0.1	7	0.1	23	0.3	21	0.2
Biol. Res. Area 1	n	0.0	n	0.0	n	0.0	n	0.0	4	0.0	4	0.0
Biol. Res. Area 2	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	1	0.0
Biol. Res. Area 3	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Biol. Res. Area 4	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Biol. Res. Area 5	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Biol. Res. Area 6	n	0.0	n	0.0	n	0.0	n	0.0	5	0.1	5	0.1
Biol. Res. Area 7	17	0.2	14	0.2	20	0.2	17	0.2	24	0.3	20	0.2
Biol. Res. Area 8	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Biol. Res. Area 9	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0
Biol. Res. Area 10	n	0.0	n	0.0	n	0.0	n	0.0	5	0.1	5	0.0
Biol. Res. Area 11	n	0.0	n	0.0	n	0.0	n	0.0	3	0.0	3	0.0
Biol. Res. Area 12	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Biol. Res. Area 13	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Biol. Res. Area 14	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0

Note: n = less than 0.5 percent; ** = greater than 99.5 percent.

Table G-17. -- Probabilities (expressed as percent chance) of one or more spills, and the estimated number of spills (mean) occurring and contacting targets over the expected production life of the lease area, pipeline transportation scenario, for spills of 1,000 barrels and greater.

Target	Within 3 days: PROPOSAL Prob	Mean	Within 3 days: DEFERRAL ALTERN. IV Prob	Mean	Within 10 days: PROPOSAL Prob	Mean	Within 10 days: DEFERRAL ALTERN. IV Prob	Mean	Within 30 days: PROPOSAL Prob	Mean	Within 30 days: DEFERRAL ALTERN. IV Prob	Mean
Sea Target 1	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 2	n	0.0	n	0.0	n	0.0	n	0.0	5	0.0	4	0.0
Sea Target 3	1	0.0	n	0.0	3	0.0	3	0.0	6	0.1	5	0.1
Sea Target 4	1	0.0	1	0.0	3	0.0	3	0.0	4	0.0	4	0.0
Sea Target 5	1	0.0	1	0.0	4	0.0	4	0.0	8	0.1	8	0.1
Sea Target 6	1	0.0	1	0.0	4	0.0	4	0.0	7	0.1	7	0.1
Sea Target 7	n	0.0	n	0.0	n	0.0	n	0.0	4	0.0	4	0.0
Sea Target 8	n	0.0	n	0.0	n	0.0	n	0.0	2	0.0	2	0.0
Sea Target 9	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 10	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 11	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 12	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	1	0.0
Sea Target 13	n	0.0	n	0.0	n	0.0	n	0.0	2	0.0	1	0.0
Sea Target 14	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	1	0.0
Sea Target 15	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 16	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	1	0.0
Sea Target 17	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 18	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 19	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 20	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 21	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 22	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 23	20	0.2	19	0.2	22	0.2	20	0.2	23	0.3	21	0.2

Note: n = less than 0.5 percent; ** = greater than 99.5 percent.

Table G-18. -- Probabilities (expressed as percent chance) of one or more spills, and the estimated number of spills (mean) occurring and contacting land segments over the expected production life of the lease area, pipeline transportation scenario, for spills of 1,000 barrels and greater.

Land Segment	------- Within 3 days ---------				------- Within 10 days --------				------- Within 30 days --------			
	PROPOSAL		DEFERRAL ALTERN. IV		PROPOSAL		DEFERRAL ALTERN. IV		PROPOSAL		DEFERRAL ALTERN. IV	
	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean
7	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	1	0.0
8	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	1	0.0
9	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	1	0.0
10	n	0.0	n	0.0	1	0.0	1	0.0	3	0.0	3	0.0
11	2	0.0	2	0.0	5	0.1	5	0.0	9	0.1	8	0.1
12	n	0.0	n	0.0	1	0.0	1	0.0	3	0.0	2	0.0
13	n	0.0	n	0.0	n	0.0	n	0.0	7	0.1	6	0.1
14	n	0.0	n	0.0	n	0.0	n	0.0	2	0.0	2	0.0
147	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	1	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 G-19. -- Probabilities (expressed as percent chance) of one or more spills, and the estimated number of spills (mean) occurring and contacting targets over the expected production life of the lease area, offshore loading transportation scenario, for spills of 1,000 barrels and greater.

Target	Within 3 days: PROPOSAL		Within 3 days: DEFERRAL ALTERN. IV		Within 10 days: PROPOSAL		Within 10 days: DEFERRAL ALTERN. IV		Within 30 days: PROPOSAL		Within 30 days: DEFERRAL ALTERN. IV	
	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean
Land	4	0.0	3	0.0	9	0.1	8	0.1	27	0.3	24	0.3
Biol. Res. Area 1	n	0.0	n	0.0	n	0.0	n	0.0	4	0.0	4	0.0
Biol. Res. Area 2	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	1	0.0
Biol. Res. Area 3	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Biol. Res. Area 4	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Biol. Res. Area 5	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Biol. Res. Area 6	n	0.0	n	0.0	n	0.0	n	0.0	6	0.1	5	0.1
Biol. Res. Area 7	19	0.2	16	0.2	23	0.3	20	0.2	27	0.3	23	0.3
Biol. Res. Area 8	2	0.0	2	0.0	2	0.0	2	0.0	3	0.0	2	0.0
Biol. Res. Area 9	n	0.0	n	0.0	n	0.0	n	0.0	2	0.0	2	0.0
Biol. Res. Area 10	n	0.0	n	0.0	1	0.0	1	0.0	8	0.1	7	0.1
Biol. Res. Area 11	n	0.0	n	0.0	n	0.0	n	0.0	3	0.0	3	0.0
Biol. Res. Area 12	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Biol. Res. Area 13	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Biol. Res. Area 14	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0

Note: n = less than 0.5 percent; ** = greater than 99.5 percent.

Table G-20. -- Probabilities (expressed as percent chance) of one or more spills, and the estimated number of spills (mean) occurring and contacting targets over the expected production life of the lease area, offshore loading transportation scenario, for spills of 1,000 barrels and greater.

Target	------- Within 3 days ---------				------- Within 10 days --------				------- Within 30 days --------			
	PROPOSAL		DEFERRAL ALTERN. IV		PROPOSAL		DEFERRAL ALTERN. IV		PROPOSAL		DEFERRAL ALTERN. IV	
	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean
Sea Target 1	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 2	n	0.0	n	0.0	n	0.0	n	0.0	5	0.0	5	0.0
Sea Target 3	1	0.0	1	0.0	4	0.0	3	0.0	7	0.1	6	0.1
Sea Target 4	1	0.0	1	0.0	4	0.0	4	0.0	5	0.1	5	0.1
Sea Target 5	1	0.0	1	0.0	4	0.0	4	0.0	9	0.1	9	0.1
Sea Target 6	1	0.0	1	0.0	4	0.0	4	0.0	8	0.1	7	0.1
Sea Target 7	n	0.0	n	0.0	n	0.0	n	0.0	4	0.0	4	0.0
Sea Target 8	n	0.0	n	0.0	n	0.0	n	0.0	2	0.0	2	0.0
Sea Target 9	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 10	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 11	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 12	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	1	0.0
Sea Target 13	n	0.0	n	0.0	n	0.0	n	0.0	2	0.0	2	0.0
Sea Target 14	n	0.0	n	0.0	1	0.0	n	0.0	1	0.0	1	0.0
Sea Target 15	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 16	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	1	0.0
Sea Target 17	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 18	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 19	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 20	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 21	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 22	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 23	23	0.3	21	0.2	24	0.3	22	0.2	25	0.3	23	0.3

Note: n = less than 0.5 percent; ** = greater than 99.5 percent.

Table G-21. -- Probabilities (expressed as percent chance) of one or more spills, and the estimated number of spills (mean) occurring and contacting land segments over the expected production life of the lease area, offshore loading transportation scenario, for spills of 1,000 barrels and greater.

Land Segment	Within 3 days				Within 10 days				Within 30 days			
	PROPOSAL		DEFERRAL ALTERN. IV		PROPOSAL		DEFERRAL ALTERN. IV		PROPOSAL		DEFERRAL ALTERN. IV	
	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean
7	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	1	0.0
8	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	1	0.0
9	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	1	0.0
10	n	0.0	n	0.0	1	0.0	1	0.0	4	0.0	4	0.0
11	3	0.0	2	0.0	6	0.1	5	0.1	10	0.1	9	0.1
12	n	0.0	n	0.0	1	0.0	1	0.0	3	0.0	3	0.0
13	n	0.0	n	0.0	n	0.0	n	0.0	8	0.1	7	0.1
14	n	0.0	n	0.0	n	0.0	n	0.0	2	0.0	2	0.0
147	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	1	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 G-22. -- Probabilities (expressed as percent chance) of one or more spills, and the estimated number of spills (mean) occurring and contacting targets over the expected production life of the lease area, pipeline transportation scenario, for spills of 100,000 barrels and greater.

Target	Within 3 days: PROPOSAL		Within 3 days: DEFERRAL ALTERN. IV		Within 10 days: PROPOSAL		Within 10 days: DEFERRAL ALTERN. IV		Within 30 days: PROPOSAL		Within 30 days: DEFERRAL ALTERN. IV	
	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean
Land	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	1	0.0
Biol. Res. Area 1	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Biol. Res. Area 2	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Biol. Res. Area 3	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Biol. Res. Area 4	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Biol. Res. Area 5	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Biol. Res. Area 6	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Biol. Res. Area 7	1	0.0	1	0.0	1	0.0	1	0.0	1	0.0	1	0.0
Biol. Res. Area 8	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Biol. Res. Area 9	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Biol. Res. Area 10	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Biol. Res. Area 11	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Biol. Res. Area 12	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Biol. Res. Area 13	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Biol. Res. Area 14	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0

Note: n = less than 0.5 percent; ** = greater than 99.5 percent.

Table G-23. -- Probabilities (expressed as percent chance) of one or more spills, and the estimated number of spills (mean) occurring and contacting targets and land segments over the expected production life of the lease area, pipeline transportation scenario, for spills of 100,000 barrels and greater.

Target	Within 3 days				Within 10 days				Within 30 days			
	PROPOSAL		DEFERRAL ALTERN. IV		PROPOSAL		DEFERRAL ALTERN. IV		PROPOSAL		DEFERRAL ALTERN. IV	
	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean
Sea Target 1	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 2	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 3	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 4	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 5	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 6	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 7	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 8	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 9	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 10	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 11	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 12	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 13	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 14	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 15	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 16	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 17	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 18	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 19	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 20	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 21	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 22	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 23	1	0.0	1	0.0	1	0.0	1	0.0	1	0.0	1	0.0

Note: n = less than 0.5 percent; ** = greater than 99.5 percent.

Land Segments with less than 0.5 percent probability of one or more contacts within 30 days are not shown.

Table G-24. -- Probabilities (expressed as percent chance) of one or more spills, and the estimated number of spills (mean) occurring and contacting targets over the expected production life of the lease area, offshore loading transportation scenario, for spills of 100,000 barrels and greater.

Target	Within 3 days PROPOSAL Prob	Mean	DEFERRAL ALTERN. IV Prob	Mean	Within 10 days PROPOSAL Prob	Mean	DEFERRAL ALTERN. IV Prob	Mean	Within 30 days PROPOSAL Prob	Mean	DEFERRAL ALTERN. IV Prob	Mean
Land	n	0.0	n	0.0	1	0.0	1	0.0	2	0.0	2	0.0
Biol. Res. Area 1	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Biol. Res. Area 2	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Biol. Res. Area 3	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Biol. Res. Area 4	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Biol. Res. Area 5	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Biol. Res. Area 6	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Biol. Res. Area 7	1	0.0	1	0.0	2	0.0	1	0.0	2	0.0	2	0.0
Biol. Res. Area 8	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0
Biol. Res. Area 9	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Biol. Res. Area 10	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	1	0.0
Biol. Res. Area 11	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Biol. Res. Area 12	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Biol. Res. Area 13	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Biol. Res. Area 14	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0

Note: n = less than 0.5 percent; ** = greater than 99.5 percent.

Table G-25. -- Probabilities (expressed as percent chance) of one or more spills, and the estimated number of spills (mean) occurring and contacting targets over the expected production life of the lease area, offshore loading transportation scenario, for spills of 100,000 barrels and greater.

Target	------- Within 3 days ---------				------- Within 10 days --------				------- Within 30 days --------			
	PROPOSAL		DEFERRAL ALTERN. IV		PROPOSAL		DEFERRAL ALTERN. IV		PROPOSAL		DEFERRAL ALTERN. IV	
	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean
Sea Target 1	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 2	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 3	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	1	0.0
Sea Target 4	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 5	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 6	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 7	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 8	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 9	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 10	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 11	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 12	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 13	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 14	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 15	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 16	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 17	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 18	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 19	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 20	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 21	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 22	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Sea Target 23	1	0.0	1	0.0	2	0.0	1	0.0	2	0.0	2	0.0

Note: n = less than 0.5 percent; ** = greater than 99.5 percent.

Table G-26. -- Probabilities (expressed as percent chance) of one or more spills, and the estimated number of spills (mean) occurring and contacting land segments over the expected production life of the lease area, offshore loading transportation scenario, for spills of 100,000 barrels and greater.

Land Segment	------- Within 3 days ---------				------- Within 10 days --------				------- Within 30 days --------			
	PROPOSAL		DEFERRAL ALTERN. IV		PROPOSAL		DEFERRAL ALTERN. IV		PROPOSAL		DEFERRAL ALTERN. IV	
	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean
11	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	1	0.0
13	n	0.0	n	0.0	n	0.0	n	0.0	1	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.

FIGURE G-1

SEA TARGETS FOR THE NORTH ALEUTIAN BASIN LEASE SALE

14 ○ SEA TARGET

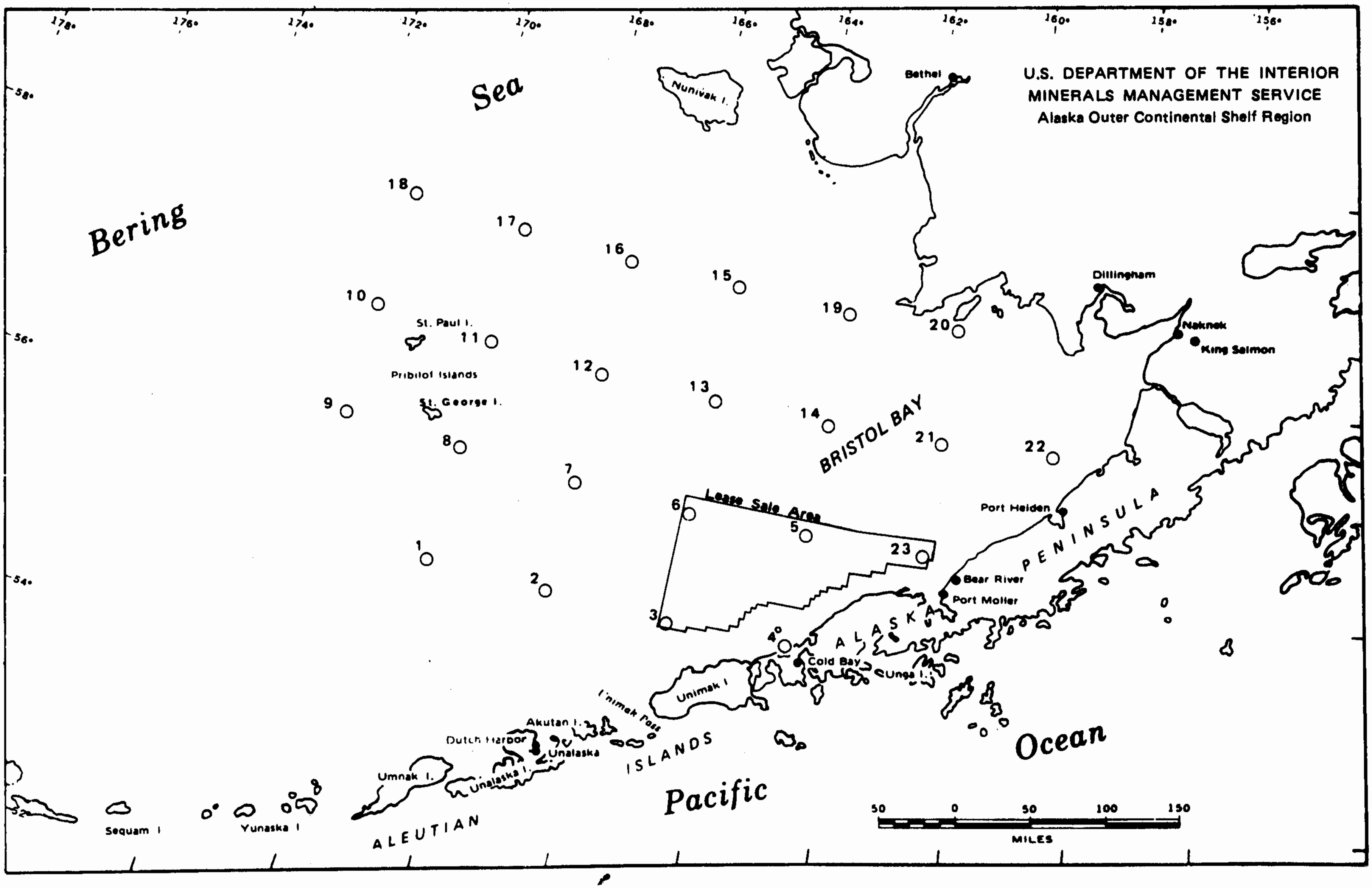
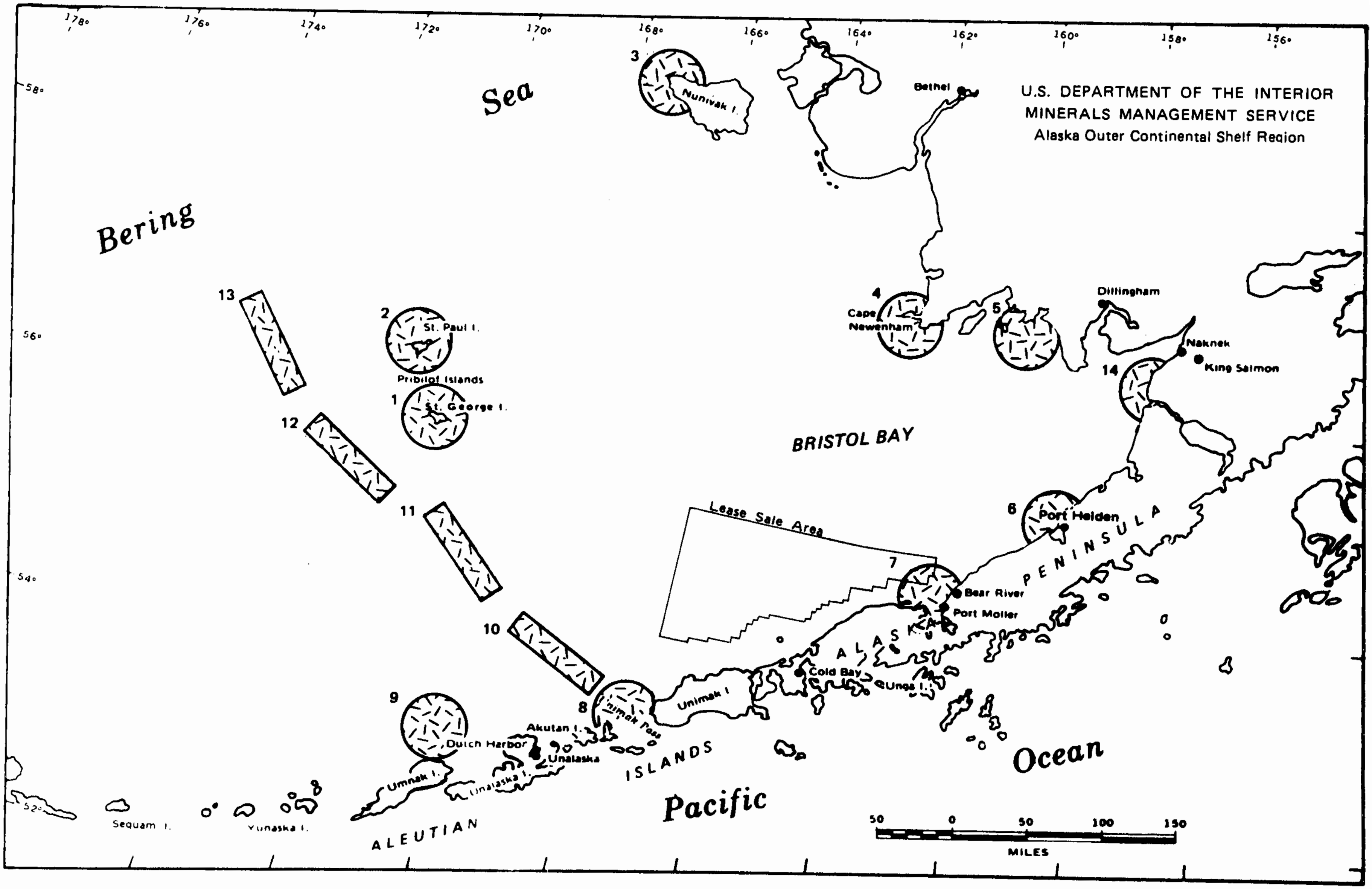


FIGURE G-2

BIOLOGICAL RESOURCE AREAS FOR THE NORTH ALEUTIAN BASIN LEASE SALE

9 BIOLOGICAL RESOURCE AREA



APPENDIX H

Biological Opinion on Endangered Species

Requested by

Minerals Management Service

Prepared by

National Marine Fisheries Service

and

Fish and Wildlife Service

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Washington, D.C. 20235

F/M411:PM

MAR 21 1984

Mr. William D. Bettenberg
Director
Minerals Management Service
Department of the Interior
Washington, D.C. 20240

Dear Mr. Bettenberg:

Enclosed is the Biological Opinion prepared by the National Marine Fisheries Service (NMFS) pursuant to Section 7 of the Endangered Species Act of 1973 (ESA), concerning the potential impacts to endangered whale species of Outer Continental Shelf (OCS) oil and gas leasing and exploration activities in the St. George and North Aleutian Basins.

Based on our review of the best available information on the proposed leasing and exploration activities in the St. George and North Aleutian Basins of the Bering Sea and on the biology and ecology of endangered whales in these areas, we have made the following determinations: (1) the general conclusions of the January 22, 1982, Bering Sea Regional and March 9, 1983, St. George Basin Biological Opinions remain valid; (2) the proposed activities are not likely to jeopardize the continued existence of the fin, humpback, bowhead, sei, blue, or sperm whales; (3) certain of the proposed activities are likely to jeopardize the continued existence of the gray and right whales; and (4) cumulative impacts to the right and gray whales may result from activities in the Bering Sea and other OCS areas. However, additional information is needed before a more reliable opinion can be rendered on such cumulative impacts.

The NMFS believes that the DOI can plan activities associated with OCS oil and gas leasing and exploration in such a way as to avoid the likelihood of jeopardizing the continued existence of the right and grey whales. The Biological Opinion contains reasonable and prudent alternatives that DOI can adopt to meet that goal.

Consultation must be reinitiated if there are subsequent modifications to the proposed action, if a species or critical habitat that occurs in the area covered by your program is subsequently listed, or if new information reveals impacts of the identified activities that may affect listed species. In addition, consultation must be reinitiated before development and production activities occur in the area.

I look forward to continued cooperation during future consultations.

Sincerely yours,

James E. Douglas, Jr.

for William G. Gordon
Assistant Administrator
for Fisheries

Enclosure

Endangered Species Act

Section 7 Consultation - Biological Opinion

Agency:

Minerals Management Service

Activities Considered During Consultation:

Oil and Gas Leasing and Exploration--St. George Basin and North Aleutian Basin

Consultation Conducted By:

National Marine Fisheries Service

Date of Issuance: MAR 21 1984

Background:

By letter of September 28, 1983, the Minerals Management Service (MMS) of the Department of the Interior (DOI) requested reinitiation of formal consultation with the National Marine Fisheries Service (NMFS) under Section 7 of the Endangered Species Act (ESA) for two proposed lease sales on the Outer Continental Shelf (OCS) of the Bering Sea: the St. George Basin (December 1984) and the North Aleutian Basin (April 1985) proposed lease offerings. Because these proposed lease offerings are scheduled within five months of each other, and will be addressed in a single environmental impact statement (EIS), and because the animals and ecosystems in these adjoining lease areas are similar, the MMS requested that formal consultation consider both areas simultaneously.

On October 4, 1983, a formal Section 7 consultation meeting was held between MMS and NMFS. At that meeting MMS provided NMFS with information available on the two proposed lease offerings. This information consisted of maps of lease area boundaries, draft exploration and development scenarios, proposed alternatives and stipulations, and oilspill risk analyses to be included in the EIS.

Previous consultations have been conducted between NMFS and MMS for this region of the Bering Sea OCS. On January 22, 1982, the NMFS issued a regional Biological Opinion for proposed OCS leasing and exploration in four planning areas in the Bering Sea. On March 9, 1983, the NMFS issued a Biological Opinion for St. George Basin Lease Sale 70, which was held on April 12, 1983. Information now available on the two newest proposed lease offerings warrants reexamination of these earlier Biological Opinions to determine if the conclusions they contain remain valid.

This is the NMFS Biological Opinion for the proposed lease offerings in the St. George Basin (December 1984) and North Aleutian Basin (April 1985) areas of the Bering Sea region. Except as modified herein, the information and conclusions of the aforementioned earlier Biological Opinions remain valid. We incorporate these Biological Opinions herein by reference.

New Information on Endangered Whales in the Southeastern Bering Sea:

Little new information is available on the species of endangered whales inhabiting these lease areas. Aerial surveys conducted in 1982 and 1983 (Leatherwood and Evans, 1982) have recorded additional sightings of several whale species within the proposed lease areas, but have not resulted in any increased understanding of whale abundance or distributions in the southeastern Bering Sea.

Our knowledge of gray whale abundance and migratory patterns remains as described in earlier opinions. Gray whales are most abundant along the perimeter of the North Aleutian Basin lease area in the spring (late March-June) where they follow the nearshore waters on their northbound migrations (Braham, in press). This coastal migration may be hindered by winter sea ice in the northern parts of Bristol Bay, and the whales may follow the ice edge on their path north. They return in the fall (October-January) and may traverse the lease areas in considerable numbers as they cross Bristol Bay in a broad front heading for the Alaska Peninsula and Unimak Pass (Rugh, in press).

Fin whales are the most common endangered whale species observed offshore on the shelf and shelf edge of the southeastern Bering Sea during the summer (Leatherwood and Evans, 1982). Some fin whales overwinter in the Bering Sea (Brueggeman, 1983).

Humpback whales are found in the southeastern Bering Sea from May through October (Braham et al., 1982). Most recent sightings have been in or adjacent to the St. George Basin lease area near Unimak Pass, the eastern Aleutian Islands, or widely distributed across the outer shelf east of the Pribilof Islands.

Bowhead whales are known to have occurred in both lease areas in the late winter and early spring (Braham et al., 1982). There have been four recorded

sightings since 1956. During unusual ice conditions, some bowheads are likely to be found in or near the northern sections of the lease areas (Brueggeman, 1982a).

Right whales have recently been observed near St. Matthew Island during the summer (Brueggeman, 1982b). The small population size of this species (less than 200) in the North Pacific has precluded many sightings in recent years. Earlier records suggest that right whales regularly occurred in the southeastern Bering Sea during the summer (Braham et al., 1982).

Other endangered whales, i.e., blue, sei, and sperm whales, may be occasional or rare entrants to these waters.

Description of Proposed Activities:

A general description of the activities associated with OCS leasing and exploration, as well as exploration scenarios for St. George Basin Sale 70 and North Aleutian Shelf Sale 75 were given in the Bering Sea Region Biological Opinion (pp. 6-10 of Attachment 1). Subsequent information on the exploration scenario for St. George Basin Sale 70 was given in the Draft and Final Environmental Impact Statements for that sale (DOI, 1981 and 1982). This information is incorporated herein by reference. This information suggests that any exploratory drilling probably would be conducted from either drillships or semisubmersibles. Because of water depth, gravel islands probably would not be used. Depending on the extent and distribution of seasonal sea ice, drilling might continue throughout the year or stop during the winter when sea ice is present (Hameedi, 1982).

Some additional information is available on the lease sales and the activities that may be associated with pre-lease and post-lease exploration in the newest proposed lease offering areas. Deferral alternatives have been identified by the MMS for the St. George Basin offering that would include a 50-mile deletion of tracts around the Pribilof Islands and/or a 50-mile deletion zone around Unimak Pass. Defferal alternatives identified for the North Aleutian Basin lease offering include deletion of the eastern tracts in inner Bristol Bay and/or a deletion of tracts within 25-miles of shore along the Alaska Peninsula.

Exploration scenarios for these sales identify Cold Bay as the location for air support facilities and Unalaska/Dutch Harbor as the marine support base. Estimates of the numbers of drilling rigs and exploratory wells to be drilled are the same in each of the lease offering areas: one exploratory rig will drill one well per year in each area, beginning in 1986 and ending in 1993.

Potential Impacts to Endangered Whales in the North Aleutian Basin:

The kinds of impacts to endangered whales that may be expected from OCS leasing and exploration were discussed in the Bering Sea Region and St. George Basin (Sale 70) Biological Opinions. No new information is available on specific impacts of concern in the St. George Basin area. The specific impacts of concern for the proposed North Aleutian Basin lease offering require additional discussion since further details of the proposed activities are now available.

Fin, gray, and humpback whales are the species most likely to inhabit the southeastern Bering Sea, residing there from approximately late March through

December (Braham et al., 1982). Gray whales probably are the first of these species to arrive. They begin entering the Bering Sea through Unimak Pass in April. Major concentrations of gray whales can be found in Unimak Pass immediately adjacent to Unimak Island and along the coast of the Alaska Peninsula in late March through May during the peak of their migration. If sea ice is present, gray whales may migrate along the ice edge and in leads that form as the ice recedes. During the spring, gray whales would be especially vulnerable to noise and vessel traffic disturbance in Unimak Pass and to any oilspills that may reach this area. Fin whales and humpback whales also may use Unimak Pass in the late spring but at lower densities.

In the summer, fin and humpback whales continue to enter the Bering Sea through Unimak Pass, and possibly other passes along the Aleutian chain, and occupy the shelf and upper slope of outer Bristol Bay. A small portion of the gray whale population inhabits the waters around the Pribilof Islands during the summer. Some right whales may also be present during the summer in portions of these lease areas.

By late fall, these whales begin leaving the Bering Sea. The southward migration routes of fin, humpback, and right whales are not known. Gray whales may cross the continental shelf of outer Bristol Bay in a broad front on their way south and are found in high numbers along the coast of the Alaska Peninsula and at Unimak Pass in November and December (Rugh, in press). The southbound migration of gray whales through Unimak Pass occurs over a somewhat shorter period of time than the northward migration in spring, again entailing virtually the entire population.

Some fin whales may overwinter in ice-free waters in the southeastern Bering Sea and bowhead whales may be present in ice-covered portions of the lease areas.

Impacts from Oilspills

Oilspills can impact whales directly by the oiling of individuals or indirectly by the effects of oil on their prey. Of the two, direct oiling is considered to be the more likely consequence of OCS activities in the North Aleutian and St. George Basins.

Oilspill trajectories calculated for the southeastern Bering Sea display significant seasonal variation due to shifts in wind and current patterns (Schumacher, 1982). Oilspill trajectories during the summer (June-August) show predominantly eastward transport of oil by the prevailing winds and currents, approaching the Alaska Peninsula and Bristol Bay (Schumacher, 1982). Trajectories from spill-sites in the southern portions of the lease areas (south of 53°30' N) could reach the shoreline of the Alaska Peninsula.

During the summer, oilspill trajectories indicate that oil also could cross shelf waters occupied by fin, humpback, and gray whales, but probably would not reach areas of known concentrations such as the Pribilof Islands or Unimak Pass.

During the fall, uncontained oilspills from the lease areas also would be transported eastward toward Bristol Bay and the Alaska Peninsula. Oilspills could transect southbound migratory paths of gray whales returning toward Unimak Pass, either across the Bristol Bay shelf or along the shoreline of the

Alaska Peninsula. A spill reaching the Alaska Peninsula or Unimak Pass during November or December would likely affect the greatest number of gray whales.

Under winter conditions (December-May), oilspill trajectories from the St. George Basin area move to the northwest, and oil spilled in the northern lease tracts could reach the Pribilof Islands within 10 days (Schumacher, 1982). During winter, an uncontained oilspill most likely would move along the shelf edge or out off the shelf. If the oil encountered the ice edge it would become associated with the marginal sea ice which would slow its further spreading.

The only endangered whales likely to be present in the Bering Sea during the winter are the bowhead whales and some fin whales. Spills occurring in openwater may be carried northward toward the sea ice front, but probably would not penetrate the marginal sea ice to the broken pack ice which bowhead whales occupy. Some fin whales overwintering south of the ice front could be impacted.

Noise and Disturbance

Increased noise levels resulting from geophysical seismic activity, vessel and aircraft traffic, and from drilling are likely to be experienced by individuals or groups of endangered whales inhabiting or transiting the North Aleutian and St. George Basins lease areas. Quantification of the effects of these sources of disturbance has not been achieved. Studies have shown that whales exhibit apparent avoidance behaviors when they are in proximity of surface vessel and air traffic, and may result in the disruption of feeding activity, the interference with socialization and communication, a general

stress increase, and the abandonment of traditional use areas (Malme et. al., 1983; Richardson, 1982; Richardson and Green, 1983).

Deep seismic geophysical exploration using airgun arrays produces loud underwater sounds which travel long distances. Source levels of 240-260 db re 1 uPa at 1 m and frequency ranges of 100 to 300 Hz characterize this type of seismic noise. If the sound source is sufficiently close, disturbance, displacement, and perhaps some physical impairment of cetacean hearing could occur (Braham et al., 1982). At greater distances, masking of communication and environmental perception is possible. Sensitivities of endangered whales to this source of disturbance is largely unknown for most species, although studies are ongoing on its effects on bowhead whales (Richardson, 1983; Reeves et al., 1983) and gray whales (Malme et al., 1983).

Cumulative Effects:

Cumulative impacts to endangered whales as a result of activities associated with these and other lease sales are possible. The DOI leasing program for the Alaska OCS calls for 13 lease sales in ten leasing areas off Alaska between 1984 and 1987. Most of the endangered whales that inhabit the southeastern Bering Sea for portions of the year also spend time in other proposed lease areas.

Gray whales in particular are subject to cumulative effects from OCS activities. Their migration path transects at least nine proposed or existing OCS lease areas between their southern range off Mexico and California and

their northern range in the Bering and Chukchi Seas. Nearly their entire Alaska habitat is in proposed lease areas. Whether the cumulative effects of OCS activities will measurably affect the health of the gray whale population or result in a likelihood of jeopardy cannot now be foreseen.

Fin and humpback whales also may be subject to the cumulative effects of OCS activities. Movements of these whales are less certain and probably less defined than those of the gray whale. Fin whales are a more oceanic species that may only be exposed to OCS impacts when in the northern parts of their range (i.e., Gulf of Alaska and Bering Sea). Humpback whales, likewise, have winter ranges that are generally outside the areas of proposed OCS activities and would be subject to impacts only when they are in Alaska waters.

Right whales, because of their decimated numbers in the North Pacific, might suffer greatly from any individual lease sale containing traditional use areas, and also may be vulnerable to cumulative effects of OCS activities in Alaska. We know too little about the present distribution and migrations of right whales in the Bering Sea to determine the significance of potential cumulative impacts to this species. Should a major portion of its northern range undergo oil and gas exploration and development, this species may be the most susceptible of all endangered whales to adverse impacts from OCS oil and gas activities.

The bowhead whale also is susceptible to cumulative impacts from OCS activities in arctic and subarctic waters. However, the southeastern Bering Sea is not known to be a regular habitat of bowhead whales and presumably OCS activities in this area would not significantly contribute to the impacts to which this species may be exposed.

It is important that OCS activities are monitored for indications of cumulative effects to endangered whales. This is a long-term effort that will require careful planning and a dedicated commitment throughout the life of the OCS program. MMS should regularly review the status of OCS activities for potential cumulative effects in planning this research and in conducting the OCS program.

Conclusions:

Based on our review of the information on the proposed oil and gas exploration activities in the North Aleutian Basin and St. George Basin areas and the biology and distribution of endangered whales available to us, we believe that the information and general conclusions contained in the Bering Sea Region and the St. George Basin (Sale No. 70) Biological Opinions remain generally valid. Conclusions specific to the North Aleutian Basin (April 1985) and St. George Basin (December 1984) are provided below.

The endangered species for which NMFS has responsibility that may be affected by the proposed activities in these sale areas are the bowhead, gray, fin, right, humpback, sei, blue, and sperm whales.

Sei, blue, and sperm whales

We believe that the proposed activities are unlikely to jeopardize the continued existence of the sei, blue or sperm whales. We base this opinion on the occasional to rare occurrence of these species in the southeastern Bering Sea. It is not considered an area of abundance for these whales.

Fin and humpback whales

We believe that the proposed activities are unlikely to jeopardize the continued existence of the fin and humpback whales. We base this belief on the widespread distribution of these species in the North Pacific and Bering Sea and on the unlikelihood that individuals of either species would be found concentrated in any portion of these lease areas for any particular length of time. Thus, any impact resulting from these sales, at most, would be likely to affect only a few individuals and would not result in jeopardy to the continued existence of the population.

We qualify this determination, however, on the assumption that the North Pacific fin and humpback populations consist of single stocks of wide ranging and intermixing individuals. It is possible that those whales inhabiting the Bering Sea may represent distinct stocks or subpopulations from those in the Gulf of Alaska. Humpback whales, in particular, may segregate as summer stocks in the Bering Sea as they do in the Gulf of Alaska (Prince William Sound and Southeast Alaska). If this is true, a Bering Sea stock of these whales inhabiting the North Aleutian and St. George Basins lease areas may be of increased vulnerability to oil and gas impacts. Greater research on stock identity, particularly for humpback whales, is needed.

Bowhead whales

The NMFS concludes that the proposed activities are not likely to jeopardize the continued existence of the endangered bowhead whale. This conclusion is based upon the belief that few bowhead whales occur in the lease sale areas. We caution MMS that our no jeopardy conclusion is based on relatively little

research concerning bowhead whale activity in this area. Bowhead whales are generally believed to overwinter in and migrate through ice-covered waters to the west and/or north of the proposed lease areas (Brueggeman, 1982a), but more site-specific information concerning the winter-spring habitat usages, such as migration, reproduction, and feeding, of bowhead whales is needed. Although the southeastern Bering Sea is not known to be a normal winter habitat, the complete winter-spring movements of this species are unclear. Consultation must be reinitiated if new information becomes available regarding bowhead whale occupation of either lease sale area.

Gray whales

The NMFS believes that certain of the proposed activities in the St. George and North Aleutian Basins lease areas are likely to jeopardize the continued existence of the endangered gray whale. Oilspills and disturbance from noise would be likely to result in adverse impacts to gray whales when they migrate through the southeastern Bering Sea in the spring and fall. Our concerns for potential impacts to the gray whale are discussed below.

A. Oilspills

The NMFS believes that an uncontrolled blowout or major oilspill in the waters of the southeastern Bering Sea during peak migration periods of gray whales is likely to jeopardize the continued existence of the species. Such an event in the spring (April to June) or late fall (November and December) has the potential to affect the greatest number of gray whales. We base this belief on the known abundance of these whales in or adjacent to the proposed lease areas at these times of the year, and on the projected movements that an

uncontained oilspill would take towards areas likely to contain migrating whales.

Spring and late fall are transitional periods between summer and winter meteorological and hydrographic conditions (Schumacher, 1982), and there exists considerable uncertainty and variability in the projected oilspill trajectories for these seasons. Nevertheless, we are particularly concerned that an oilspill from either the St. George or North Aleutian Basins lease areas could reach Unimak Pass or the north shore of the Alaska Peninsula during either season and could affect a significant number of these whales. An oilspill during the fall may also intercept numerous gray whales migrating across the shelf from Nunivak Island to the Alaska Peninsula. Little is known concerning the size of the migratory population using this route, but there is recent information that this may be a significant migratory corridor for many gray whales (Rugh, in press).

The NMFS believes that the DOI can develop suitable measures for oilspill prevention and oilspill cleanup to ensure that any spilled oil does not reach these important habitats. The DOI can plan exploration activities to avoid the likelihood of jeopardizing the continued existence of this species, as required by Section 7(a)(2) of the ESA. Below we offer reasonable and prudent alternatives that the DOI can adopt to meet this goal.

B. Noise

1. The NMFS believes that the impacts of drilling noise from the proposed lease areas are unlikely to jeopardize the continued existence of the gray whale.

2. We believe that openwater geophysical seismic surveys ("deep seismic" using airgun arrays) would be likely to jeopardize the continued existence of gray whales if such activity forced them to alter their normal migration routes around or across Bristol Bay or prevented them from using the Unimak Pass migration corridor. The DOI can plan these surveys to avoid adverse impacts to gray whales and thereby avoid the likelihood of jeopardizing the continued existence of the species, as required by Section 7(a)(2) of the ESA. Below we offer reasonable and prudent alternatives that the DOI can adopt to meet this goal. We believe that high-resolution ("shallow seismic") surveys using weaker energy sources would be unlikely to jeopardize the species because of their reduced range of effects.

3. We believe that vessel and aircraft traffic resulting from these lease sales would be unlikely to significantly increase present levels of traffic in or near gray whale habitats, and would not be likely to jeopardize the continued existence of the species. However, we have recommended that a 1500 ft minimum altitude be observed by aircraft over areas occupied by endangered whales to lessen the likelihood of harassment.

C. Physical Impacts

Because no gravel islands will be constructed and low levels of exploratory drilling activity are anticipated, the NMFS believes that drilling platforms and other related structures, vessel traffic and other activities associated with exploration that may cause physical impacts to gray whales (i.e., collisions) or result in habitat alteration are unlikely to jeopardize the continued existence of this species.

D. Cumulative Impacts

The gray whale potentially is subjected to impacts from oil and gas activities throughout its range. Because of the relatively short history of OCS activities in Alaska, we are unable to identify the level of cumulative impacts beyond which there would be significant adverse impacts to the endangered gray whale. Therefore, we are unable to reach a conclusion as to the likelihood of jeopardizing the gray whale from the cumulative effects of oil and gas activities. The NMFS believes that considerably more attention should be given to potential cumulative impacts to gray whales in planning all OCS oil and gas activities.

<u>Right whales</u>

The NMFS believes that certain of the proposed activities are likely to jeopardize the continued existence of the endangered right whale. Historically, the southeastern Bering Sea was normal habitat for the North Pacific right whale (Berzin and Doroshenko, 1982). At present, this species is known to occur north of the St. George Basin during the openwater season, and may inhabit the St. George Basin area also. Although observations of right whales in the Bering Sea are rare, two individuals were sighted near St. Matthew Island in the summer of 1982 (Brueggeman, 1982b). Because of the possibility of site-fidelity for traditional use areas, right whales may reappear seasonally in some areas. Our concerns for potential impacts to the right whale are discussed below.

A. Oilspills

The NMFS believes that a major oilspill or uncontrolled blowout in areas where and when right whales would be affected would be likely to jeopardize the continued existence of the species. We base this belief on the critically small population size (less than 200 individuals) of the North Pacific right whale. Because this species is nearly extinct, we believe that adverse impacts to small numbers of right whales probably would have severe adverse effects on the entire population.

Therefore, we believe that satisfactory precautions must be taken to prevent impacts to right whales from spilled oil. The NMFS believes that it is possible for MMS to plan and conduct activities during the exploration phase in the North Aleutian Basin and St. George Basin areas to avoid the likelihood of jeopardizing the continued existence of the right whale. Below we offer reasonable and prudent alternatives that the DOI can adopt to meet this goal.

B. Noise

1. The NMFS believes that the impacts of drilling noise in the proposed lease areas are not likely to jeopardize the continued existence of the right whale.

2. We believe that "deep seismic" geophysical surveys using airgun arrays would be likely to jeopardize the continued existence of the right whale if such activities disturbed the feeding, mating or calf rearing activities of this species. We believe that it is possible for the DOI to plan these activities in such a manner as to avoid impacts to the right whale and therefore avoid the likelihood of jeopardizing the continued existence of this species. Below we offer reasonable and prudent alternatives that the DOI can

adopt to meet this goal. We believe that high-resolution ("shallow seismic") surveys using energy sources considerably weaker than airguns would be unlikely to jeopardize right whales.

3. We believe that vessel and aircraft traffic could temporarily displace right whales from traditional use areas as well as disrupt feeding or social behavior. This could jeopardize the continued existence of this species. Below we offer reasonable and prudent alternatives that DOI can adopt to avoid the likelihood of jeopardy to this species.

C. Physical Impacts

The NMFS believes that drilling platforms and other structures, vessel traffic, and activities associated with exploration in the proposed lease areas that may cause physical impacts (i.e., collisions) to right whales or result in habitat alterations are unlikely, and therefore not likely to result in jeopardy to the continued existence of this species. We emphasize that this conclusion is based upon limited data on the extent of such activities or on the presence of endangered right whales in these lease areas.

D. Cumulative Impacts

The right whale potentially may be most susceptible to cumulative impacts resulting from OCS activities. We believe that adverse impacts to the right whale from such activities would be likely to jeopardize the continued existence of the species due to its critically small population size. Presently there is not sufficient information on the distribution, migration, and habitat use of right whales to determine the significance of potential cumulative impacts to the species. Therefore, we are unable to reach a conclusion as to the likelihood of jeopardy to right whales resulting from cumulative effects of oil and gas activities. The NMFS believes that considerably more attention should be given to these impacts to right whales in planning all OCS oil and gas activities.

Reasonable and Prudent Alternatives:

Section 7(b) of the ESA requires that the NMFS suggest reasonable and prudent alternatives that the DOI can adopt to avoid the likelihood of jeopardizing the continued existence of endangered species. Below we provide reasonable and prudent alternatives concerning the proposed North Aleutian and St. George Basins lease offerings. The DOI must develop appropriate measures to ensure that the proposed activities are not likely to jeopardize the continued existence of the endangered gray or right whales.

Oilspills

Major oilspills or well-blowouts can have severe adverse impacts on right whales that may be present in or near the proposed lease areas during the openwater season, and on gray whales during their spring and fall migrations through Unimak Pass and in the southeastern Bering Sea. The DOI must ensure that the waters in and adjacent to areas inhabited by right whales and migrating gray whales are free of spilled oil. In developing the necessary measures to provide this assurance, the DOI should carefully consider the time necessary for lessees to control a blowout and clean up spilled oil as well as the environmental conditions that may affect the time necessary for cleanup.

To avoid the likelihood of jeopardy to the gray whale, we believe that the identified alternatives given by MMS of leasing deferrals within a 50-mile radius of Unimak Pass and the Pribilof Islands, and within 25 miles of shore along the Alaska Peninsula, will substantially reduce the risk of oilspills to gray whales and should be adopted. To provide protection for right whales that may occur in or near the proposed lease areas, the DOI should develop a measure for temporary suspension of drilling, when it can be done in a safe manner, if right whales are encountered or believed to be present in the vicinity of a drilling operation.

Noise Disturbance

Deep seismic geophysical operations should only be conducted in waters near Unimak Pass or along the Alaska Peninsula at times of the year and in such a manner that do not disturb the spring and fall migrations of gray whales in the southeastern Bering Sea or through Unimak Pass. Deep seismic geophysical operations should not be conducted in the lease areas when right whales are present.

Vessel and aircraft traffic should maintain minimum approach distances from right whales (one mile horizontal, 1500 feet vertical) and should avoid areas known to be inhabited by right whales.

The NMFS should be consulted in developing the guidelines necessary to meet the above criteria, which should include monitoring for the presence of right and gray whales by those engaged in OCS activities. In this regard, we believe that the provisions contained in the Final Notice of Sale for

St. George Basin Lease Sale 70, if adopted for these lease sales, will avoid the likelihood of jeopardy to gray and right whales from noise disturbance impacts.

Research Needs:

The NMFS recognizes the valuable research efforts conducted to date by the Environmental Studies Program of the Alaska OCS Office of MMS, and we encourage their continuation. Below we provide our assessment of the kinds of additional information that need to be obtained before NMFS can formulate a more thorough Biological Opinion concerning the likelihood of jeopardy to endangered whales from future OCS activities in the North Aleutian Basin and St. George Basin. Although we need better information on all endangered whale species in this area, research efforts should emphasize the fin, gray, humpback, bowhead, and right whale.

A better understanding is needed on the effects of oil on large cetaceans, either from direct contact with spilled oil or as a result of indirect effects through changes in food supplies. The effects of oil on potentially sensitive tissues such as the skin, eye, or respiratory system are not certain. Ingestion of oil may affect feeding ability (i.e., baleen fouling), digestive and metabolic processes, and could be toxic to cetaceans in sufficient dosages. An ability of large cetaceans to detect and avoid oil would reduce the potential for these effects, but this ability is not known.

Noise may affect endangered whales. The types and levels of noise necessary to elicit behavioral responses are poorly known for most species. The relative sensitivity of different species and changes in sensitivities under

different conditions are also unknown. In particular, the potential effects of geophysical seismic explofation on cetacean behavior needs to be studied. Short-term responses to noise are being studied and these studies should be continued. A better understanding of the behavior and social systems of these whales is needed to understand the relevance of these responses to long-term effects on the species.

The distribution and abundance of endangered whale populations in the southeastern Bering Sea are still largely unknown. Abundance, seasons of occurrence, and migration paths need better definition for all species. Continued systematic aerial and shipboard surveys covering all seasons are necessary to acquire more reliable population estimates and more quantitative habitat usage information.

For humpback whales specifically, a study of stock identity using photo-identification methods is important. Such studies elsewhere in the eastern North Pacific have provided a valuable data base from which to compare individuals and assess stock segregation and local habitat use patterns.

Unimak Pass is essential to the normal movements of most whales that enter and leave the Bering Sea. The use of Unimak Pass by these whales has been adequately documented only for gray whales. Better information on the movements of other whales through Unimak Pass, and the southbound movements of gray wheles across the southeastern Bering Sea is needed.

The cumulative effects of OCS activities are a major concern especially for the development and production phases, and deserve greater attention for the reasons mentioned earlier.

Recommendations:

Section 7(a)(1) requires that Federal agencies utilize their authorities in furtherance of the purposes of the ESA by carrying out programs for the conservation of endangered and threatened species. To help the DOI meet this responsibility with respect to OCS activities in the Bering Sea, the NMFS offered additional recommendations in the Bering Sea Region Biological Opinion, and for the St. George Basin Sale 70 area. These recommendations are repeated below.

1. We recommend that MMS continue to fund research on the distribution, abundance, and habitat use of endangered whales in the Bering Sea. We recommend that MMS support those research needs for the North Aleutian Basin and St. George Basin areas that are identified earlier in this document.

2. We recommend that MMS conduct long-term monitoring of the locations and movements of endangered whales in the southeastern Bering Sea relative to the locations exploration activities, to assure that whales are not being affected by these activities.

3. We recommend that MMS continue efforts to understand the impacts of oilspills and noise on endangered whales. Specifically, we recommend the implementation of studies on the impacts of seismic geophysical noise on whales, especially gray whales, in the Bering Sea, and a continuation of these studies for other whales, such as the bowhead whale in more northern waters.

4. We recommend that MMS support efforts for the photo-identification of humpback whales in the Bering Sea to assess the questions of stock separation, seasonal movements, and habitat utilization.

5. Since the occurrence and distribution of cetaceans in the Bering Sea is not well known, the NMFS desires to expand the existing data base. Analysis of historical whaling records may provide important habitat use information and seasonal distribution of many of the commercially exploited whale species that occupy the Bering Sea, and we encourage these whaling records to be analyzed for this information. We further believe that the proposed exploratory activities furnish a valuable opportunity for obtaining additional new information on endangered whales, and therefore request that all large cetacean sightings during exploration activities be required to be reported to the Platforms of Opportunity Program of the National Marine Mammal Laboratory. The NMFS will furnish identification guides.

6. We recommend that the Bering Sea Biological Task Force, of which the NMFS will be a member, assist the DOI in OCS-related decisions for these lease sales that may affect endangered species and other biological resources of this region.

7. Lessees should be notified, through information contained in the Notice of Sale and the lease, of guidelines that vessel and aircraft operators should follow to avoid any potential harm to these cetaceans. Attachment 2 provides guidelines to vessel and aircraft operators to avoid harassing endangered

whales. Since whales are sensitive to aircraft noise, aircraft operators should maintain a 1500 foot minimum altitude when flying over areas occupied by endangered whales.

Opportunities for Additional Consultation:

Informal consultation will be conducted on a continuing basis as necessary for post-sale activities in these lease areas. During the exploration phase, the DOI has agreed to provide the NMFS with all seismic permits and with exploratory drilling plans, including oilspill contingency plans and any subsequent revisions of such plans. Future actions that will affect endangered whales may require additional consultation pursuant to Section 7(a)(2) of the ESA. These actions will be evaluated as they become known, and we will continue to review, on a case-by-case basis, all new information that becomes available to us. The DOI should also continually review these plans to determine if and when further Section 7 consultation is necessary.

Formal consultation under Section 7 must be reinitiated upon initiation of the development phase in these and other Bering Sea lease areas. At such time, any additional information available on the potential impacts of endangered whales will be evaluated, details on the location and magnitude of OCS development will be gathered, and a new Biological Opinion will be issued.

Formal consultation must also be reinitiated if: new information reveals impacts of the proposed exploration activities that may affect listed species; the identified exploration activities are modified in a manner not considered herein; or a new species is listed or critical habitat is designated that may be affected.

This biological opinion in no way permits the taking of any endangered whales. Taking of such species, unless properly permitted, is prohibited under Section 9 of ESA and under Section 102 of the Marine Mammal Protection Act (MMPA). Section 17 of the ESA states that unless otherwise provided, no provision of the ESA shall take precedence over any more restrictive provision of the MMPA. Under Section 101(a)(3)(B) of the MMPA taking of depleted species of marine mammals can be permitted only for scientific purposes. Accordingly, no statement concerning incidental takings pursuant to Section 7(b)(4) of the ESA is appended to this opinion.

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Attachment #1

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Mr. Robert Burford
Director
Bureau of Land Management
Department of the Interior
Washington, D.C. 20240

Dear Mr. Burford:

Enclosed is the Biological Opinion prepared by the National Marine Fisheries Service (NMFS) under Section 7 of the Endangered Species Act of 1973 (ESA) concerning the impact of the Outer Continental Shelf (OCS) oil and gas leasing program and associated exploration activities in the Bering Sea Region on endangered whales. Activities associated with production and development will be considered in future consultations.

Based upon our evaluation of the available information concerning the biology and distribution of endangered whales and the nature, extent and location of OCS activities the National Marine Fisheries Service (NMFS) concludes that there is insufficient information to make a reliable determination concerning the likelihood of jeopardizing the continued existence of endangered whales. Despite the inconclusive Biological Opinion the NMFS believes that it is possible for the Department of the Interior (DOI) to plan OCS explortory activities in the Bering Sea Region so that they are not likely to jeopardize the continued existence of endangered whales. This belief is based in part upon DOI's intention to reinitiate consultations pursuant to Section 7(a)(2) of the ESA for future lease sales in the Bering Sea Region. The DOI should also examine additional information on OCS activities in the Bering Sea Region and on the biology and distribution of endangered whales to determine if additional Section 7 consultations are required. Our Biological Opinion includes reasonable and prudent alternatives and recommendations to assist DOI in planning OCS activities in the Bering Sea Region and fulfilling its obligations under Section 7 of the ESA.

The Biological Opinion also provides DOI with an indication of the information that NMFS must have before a reliable determination on the likelihood of jeopardy to endangered whales from OCS activities in the Bering Sea Region can be made. The NMFS is aware of the considerable research efforts on endangered whales that the Bureau of Land Management has sponsored or conducted. We applaud this effort and encourage its continuation.

Consultation also must be reinitiated if there are subsequent modifications to the proposed action, if a species or critical habitat that occurs in the area covered by your program is subsequently listed, or if new information reveals impacts of the identified activity that may affect listed species. In addition, consultation must be reinitiated before development and production activities occur in the Bering Sea Region.

We look forward to continued cooperation during future consultations.

Sincerely yours,

/s/ Richard B. Roe
for William G. Gordon
Assistant Administrator
for Fisheries

Endangered Species Act

Section 7 Consultation - Biological Opinion

Agencies: Bureau of Land Management and U.S. Geological Survey

Activities Considered During Consultation: Outer continental shelf oil and gas leasing and exploration in the Bering Sea Region encompassed by proposed lease sales in Norton Basin (57, 88, 99), St. George Basin (70, 89, 101), Northern Aleutian Shelf (75, 92), and Navarin Basin (83, 107).

Consultation Conducted By: National Marine Fisheries Service (NMFS), Alaska Region

Background

On June 6, 1980, the Bureau of Land Management (BLM) and the U.S. Geological Survey (USGS) requested formal joint regional consultation pursuant to Section 7 of the Endangered Species Act of 1973 (ESA) on four proposed outer continental shelf (OCS) oil and gas lease sale areas in the Bering Sea Region (i.e., Norton Sound, St. George Basin, Northern Aleutian Shelf, and Navarin Basin) with regard to potential impacts of the Department of the Interior's (DOI) OCS oil and gas program on endangered and threatened species. As a result of that request, representatives of BLM, USGS, and NMFS met in Anchorage, Alaska on June 25, 1980, to discuss endangered species that might be affected by the proposed regional OCS oil and gas activities.

The NMFS agreed to conduct an "aggregate" consultation for OCS oil and gas leasing and exploration in the Bering Sea Region encompassed by the proposed lease sales in Norton Basin, St. George Basin, Northern Aleutian Shelf, and Navarin Basin. An "aggregate" consultation, as described in

50 CFR Section 402.04(a)(3), 43 FR 871, is an efficient approach to comply with consultation requirements of Section 7(a)(2) of the ESA, in that the BLM and USGS will be aware of additional information needs and potential problems at an early phase in the oil and gas leasing program in the Bering Sea. This is NMFS's Biological Opinion for OCS gas and oil leasing program in the Bering Sea Region.

Although NMFS considered the entire range of OCS activities in the consultation process, this Biological Opinion addresses only the leasing and exploration phases of OCS activities in the Bering Sea Region. Activities covered by this opinion include pre-lease exploration (geophysical surveys and Continental Offshore Stratigraphic Test Wells (COST Wells)), the lease sale, and post-lease exploration (geophysical surveys, construction, exploratory drilling, and associated support activities). BLM-sponsored research on the distribution and abundance of endangered whales, and on the effects of oil and other OCS activities has not been completed. When available, NMFS will review the results of the completed studies and plans for future exploration. DOI indicated that consultation will be reinitiated for each lease sale in the Bering Sea Region. In addition, DOI must review exploration plans and activities to determine whether consultations on those individual activities must be reinitiated. When the development and production phases are reached and as information on the specific impacts of the activities, including the cumulative impacts of the program becomes available, formal consultation must be reinitiated.

Consultation was conducted for the eight endangered species of whales listed below. No other listed species for which NMFS is responsible occur in the Bering Sea. There are no species proposed for listing or any designated or proposed critical habitat in the Bering Sea Region.

Common Name	Scientific Name
Right Whale	*Balaena glacialis*
Bowhead Whale	*Balaena mysticetus*
Gray Whale	*Eschrichtius robustus*
Fin Whale	*Balaenoptera physalus*
Sei Whale	*Balaenoptera borealis*
Blue Whale	*Balaenoptera musculus*
Humpback Whale	*Megaptera novaeangliae*
Sperm Whale	*Physeter macrocephalus* (= *P. catodon*)

Appendix I gives information about the population size, status, and occurrence of each of the endangered whales in the various lease areas.

This biological opinion discusses the distribution of endangered whales in the Bering Sea Region under consideration for OCS oil and gas leasing, the type and scope of the proposed exploratory activities, the possible impacts of pre- and post-sale exploration activities on endangered whales, and the research required to gather additional data and information. This opinion addresses the question of whether lease sales and exploration activities in the Bering Sea are likely to jeopardize the continued existence of endangered species of whales.

Proposed Lease Areas As Whale Habitats

The four proposed lease areas of the Bering Sea are important to the normal activities and movements of endangered whales. The lease areas encompass whale habitats that are vital to the survival of certain of these species. Individually, and collectively, OCS activities in these lease areas have the potential to harm populations of endangered whales.

Norton Basin:

Bowhead and gray whales frequent the area north of St. Lawrence Island and west of Sledge Island in the outer Norton Basin area (west of 166°W longitude). This area is vital to the spring and fall migrations of the bowhead and is a major feeding area for the gray whale. The lagoons and

nearshore coastal areas around St. Lawrence Island, especially near the western, southern, and eastern ends, are important feeding grounds for gray whales in the summer and fall. Chirikof Basin, north of St. Lawrence Island, is an extremely important feeding area for many gray whales during the summer and early autumn.

The Bering Strait is an important migratory corridor for bowhead, gray and some humpback and fin whales traveling to and from summer feeding grounds in the Chukchi and Beaufort Seas. Bowhead whales follow open leads in the pack ice to move north through the Bering Strait in April-May, and return south through the Bering Strait ahead of the pack ice in November-December. Gray and humpback whales travel through the Bering Strait from June to October when the pack ice is absent or sparse.

Fin, humpback, and perhaps sei whales seasonally occur in or adjacent to the outer Norton Basin area. Although right whales formerly fed in this area during summer, neither they nor blue nor sperm whales are known to occur there now. Inner Norton Sound is only occasionally occupied by any of these whales.

Navarin Basin:

The entire western Arctic population of bowhead whales may overwinter in the broken pack ice of the central Bering Sea, mainly south and west of St. Lawrence Island as far south as the ice front edge, and perhaps farther south into open water. Although the exact location of overwintering probably varies with the type and extent of the seasonal ice edge, the shelf portions of the Navarin Basin must be considered an important bowhead whale overwintering area.

The outer shelf edge of the Navarin Basin area also may be seasonally important as a summer feeding area for the fin whale, and possibly the humpback whale. Its importance to the Pacific right whale is unknown. The other whale species probably are only occasional visitors to this area.

St. George Basin:

The St. George Basin area is inhabited by gray whales from spring through fall. During the summer, a few dozen gray whales feed in shallow waters off the Pribilof Islands. A large segment of the gray whale population probably migrates southward directly through the northeast portion of the Basin from mid-October to late December.

Unimak Pass, southeast of the St. George Basin area, is an important migratory corridor for the entire eastern Pacific population of gray whales. Gray whale movements north through Unimak Pass peak in April and May, and the southward return through the Pass, peaks in November and December. The Pass is used by other species of whales as well.

Fin and humpback whales occur seasonally in the St. George Basin in the late spring and summer. Fin whales appear to concentrate over the continental slope and shelf edge. Humpback whales are found throughout the lease area; most sightings are near the Aleutian and Pribilof Islands.

A few individuals of the other whale species also may be found occasionally in this area, mostly in the summer and fall. A few bowhead whales have also been observed in the northwest portion of the lease area, all in early spring.

Northern Aleutian Shelf:

Almost the entire population of the gray whale passes near the North Aleutian Shelf area during migration northward in April-June and southward in late October through December. The east shore of Unimak Pass is the focal point of the migratory corridor. After entering the area through Unimak Pass, most gray whales migrate close to shore (within 3 km) and follow the perimeter of Bristol Bay to Nunivak Island. Gray whales feed in the shallow coastal areas along the north side of the Alaska Peninsula and Bristol Bay during their spring migration. In the fall, most gray whales pass within 1 km of the

west and south shores of Unimak Island as they leave the Bering Sea. Some fin whales summer along the shelf-edge, and small numbers of humpback, blue, sei, and right whales may occur in the spring-fall period in this area. Bowhead and sperm whales are not known to occur in this area.

Description Of Proposed Activities

A. Pre-lease Exploration And The Lease Sale

Prior to a lease sale, geophysical seismic information is gathered by geophysical companies. In the Bering Sea this typically is done by vessel surveys during the open water season. A considerable amount of high resolution, acoustic geophysical exploration already has been conducted in potential Bering Sea lease areas under USGS permits since April 15, 1975, and further surveys probably will be conducted in each area. These geophysical operations are carried out with ships up to 100 meters in length. Current geophysical technology entails the use of "air guns" or "sparkers." A limited amount of research (primarily observing responses of bowhead whales to these operations during the summer and fall) on the effects of these systems on cetaceans has recently begun in Arctic waters. Results to date have not been conclusive.

In most lease areas, one or more COST Wells are drilled prior to a lease sale to obtain geological samples of the rock and sedimentary structures of the area. COST Wells are drilled in the manner of any exploration well except that they typically are not drilled at a location where hydrocarbon reservoirs are believed to exist. Results of COST well drilling provides information on whether the sedimentary structures contain source rocks and reservoir rocks suitable for hydrocarbon generation and retention. Impacts associated with COST Wells include industrial noise, vessel and aircraft traffic, drilling muds and cuttings disposal, etc., but do not include an oil spill risk from

the well. On-structure drilling of COST Wells now is allowed but has not been requested by industry for the Alaska OCS. Such an activity would add the risk of an oil spill to the pre-lease activities and would require careful review and additional consultation pursuant to Section 7(a)(2) of the ESA.

Activities involved with OCS lease sales consist of offering the leases, submission of bids, and awarding of leases to the successful bidders.

B. Post-lease Exploration

After leases have been issued, the lessees are authorized, and in some instances required, to perform certain activities. Lessees may undertake certain environmental studies at this stage as part of their preparation of an exploration plan. These may include studies specifically required by lease stipulations and, if needed, studies to provide descriptions of the air quality, oceanographic conditions, and flora and fauna in the leased area that may be disturbed by exploration activities. Geological studies may involve bottom drag sampling or shallow coring. Other studies may employ certain high resolution geophysical instrumentation such as fathometers to determine topography and water depth, and sidescan sonar to map sea bottom irregularities. These studies use accepted sampling techniques that are passive in nature or localized in range.

Exploration plans identify where and how exploratory drilling will occur, and the Environmental Report that accompanies each exploration plan describes the potential impacts of the proposed exploration activities on the marine and coastal environments.

The type of offshore drilling unit used to drill exploratory wells in the Bering Sea will depend upon many factors including environmental conditions and water depth at the site, anticipated duration of the drilling program, type of unit available, time of year, and economic considerations. Depending upon conditions, jack-up rigs, semi-submersibles, or drillships will be

employed as drilling platforms in the Bering Sea, and in some shallow areas in the Norton Sound area gravel islands may be used.

It is not known at this time how many or where exploratory and delineation wells will be drilled (the USGS has projected that 90 wells may be drilled in the four Bering Sea lease areas). Specific proposals on these matters will be stated for the first time in proposed exploration plans submitted by the individual lessees. The USGS issues drilling permits and will establish criteria under their operating orders to regulate the drilling activities. The U.S. Coast Guard (USCG) is responsible for permitting fixed and mobile drilling platforms and exploratory drilling vessels on the OCS. Construction of gravel islands in U.S. waters will require a permit from the Department of the Army, Corps of Engineers (COE) pursuant to Section 10 of the River and Harbor Act of 1899 and Section 404 of the Clean Water Act. The National Pollution Discharge Elimination System (NPDES), created by the Clean Water Act and administered by the Environmental Protection Agency (EPA) is applicable to fixed platforms and rigs engaged in OCS oil and gas activities. Each of these agencies has consultation responsibilities under Section 7(a)(2) of the ESA for their involvement in these activities. NMFS will consult with these agencies as required by ESA. Additionally, lease stipulations covering these activities remain to be developed. Such stipulations should include protective measures for endangered whales. We provide recommendations and reasonable and prudent alternatives herein to help DOI meet its obligations under Section 7 of the ESA. The NMFS will review stipulations for their adequacy in protecting endangered whales.

C. Exploration Scenarios

Estimates on the proposed exploratory activities in the four Bering Sea lease areas have been presented for the proposed five-year schedule.[1] The

[1] DOI. Draft Supplement to the Final Environmental Statement. Proposed Five-year OCS Oil and Gas Lease Sale Schedule. Jan. 1982-Dec. 1986. BLM. 66 pp + six appendices.

following discussion is based on these estimates. It should be recognized that these figures are likely to change as more detailed information is obtained. (The latest proposed schedule, (July 1981) has not yet been approved by Congress as required by law. Currently scheduled sale dates on sales 57 to 83 are taken from the June 1980 schedule.)

Norton Basin, Sales 57, 88, 99:

The first sale (57) is scheduled for November, 1982. Additional sales are planned for October, 1984 (88) and October, 1986 (99). USGS estimates the oil and gas potential of the Norton Basin area at 0.71 billion barrels (BBbl) of oil and 2.17 trillion cubic feet (TCF) of gas.

Up to five exploratory rigs may work in the area at any given time, and USGS estimates that a total of 20 exploratory and delineation wells would be drilled. Jack-up rigs will be preferred equipment for operations during the open water season in water depths greater then 20 meters. Drillships may be utilized in deeper waters, and gravel islands may be constructed in water less than 8 meters on 35 nearshore tracts just north of the Yukon Delta. Exploration could occur from 1983 to 1995.

Nome probably will be the primary support base. Existing facilities will be used to the extent possible, thereby eliminating or minimizing the need for new onshore construction. If gravel islands are constructed on shallow tracts, activities will be supported in the winter by anchored work barges holding heavy, bulky supplies. Alternatively, gravel islands could be supplied with icebreaker assistance. Air traffic would transit in and out of Nome, and possibly Unalakleet.

St. George Basin, Sales 70, 89, 101:

The first sale (70) is scheduled for December, 1982. Subsequent sales are proposed for December, 1984 (89) and December, 1986 (101). USGS estimates the oil and gas potential of the St. George Basin area at 1.48 BBbl of oil and 4.28 TCF of gas. A maximum of 3 exploratory rigs would work the area at any given time, drilling a total of 29 exploratory and delineation wells. Preferred rigs are larger semi-submersibles that can operate year-round unless severe ice-buildup occurs in abnormally cold winters. Drillships will be the equipment of second choice. Exploration wells will be drilled between 1984 and 1995.

Dutch Harbor will be the likely primary support base for exploration. Existing facilities would be used to the extent possible. Cold Bay may become a transit exchange base for personnel flying to and from the sale area.

Northern Aleutian Shelf, Sales 75, 92:

The first sale (75) is scheduled for October, 1983. A subsequent sale is proposed for April, 1985 (92). The Northern Aleutian Shelf area is estimated to contain 0.99 BBbl of oil and 2.37 TCF of gas. Hydrocarbon potential is believed to be highest in the southern portion of the area, near Cold Bay.

No estimates are available for the number of rigs that may operate in this area, but the number probably would be similar to that anticipated for the Norton and St. George Basin areas. It is estimated that 20 exploration and delineation wells may be drilled, between 1984 and 1996. Shore bases would be the same as used for the St. George lease area, i.e., Dutch Harbor and Cold Bay.

Navarin Basin, Sales 83, 107:

The first sale (83) is scheduled for December, 1984. A subsequent sale is proposed for March, 1985 (107). The Navarin Basin's oil and gas potential is estimated at 1.74 BBbl of oil and 7.14 TCF of gas. The northwest area near the U.S. - Russia 1867 Convention Line is believed to have the greatest potential for hydrocarbons. The number of exploratory rigs that may operate in this area is unstated. Based on the larger oil reserve potential of Navarin Basin compared to other Bering Sea lease areas, a greater number of exploratory rigs may be used. An estimated 30 exploration and delineation wells will be drilled between 1985 and 1998.

Until tracts are selected it is not possible to predict specific areas of impact. St. Paul and/or St. Matthew Island may serve as forward supply bases for operation in this area.

Potential Impacts To Endangered Whales From The Proposed Activities

Potential effects of oil and gas exploration and related human activities on endangered whales include the following:

1. Behavioral disturbances caused by noise from geophysical seismic surveys, aircraft and ship traffic, construction activities, and drilling activities. These disturbances could cause alterations of migration pathways with unknown effect, or displacement from feeding or breeding grounds;

2. Physical impacts from the placement of structures in areas inhabited by the whales;

3. Oil spills which, if they occurred when whales are present, could cause fouling of the feeding mechanism (baleen plates), disruption of respiratory function, ingestion of oil with uncertain effects on whale physiology, the irritation of skin and eyes, or a reduction of food supplies through contamination or alteration of the marine habitat.

Noise Disturbance:

Noise associated with petroleum exploration can affect whales adversely.[2] High frequency sounds cause permanent ear damage in laboratory animals and could affect marine mammals adversely. Low frequency sounds that are likely to result from petroleum exploration are less destructive than high frequency sounds; low frequency affects are difficult to determine. Although adverse physical effects from low frequency sounds on cetaceans are unknown, noise does have nonauditory stress affects on birds and mammals. These include physiological stress involving hormonal responses leading to lowered resistance and increased vulnerability to environmental disturbances, and endocrine imbalances that may affect reproduction adversely. The extent to which cetaceans may be susceptible to such stress-mediated effects is unknown.

Cetaceans rely on their well-developed auditory sense for communication and/or echo-location. Background noise from oil and gas activities in the marine environment could interfere with these functions and result in social disruption and echo-confusion.

Noise from boat and air traffic and from drilling activities could affect cetaceans moving through or feeding in OCS oil and gas exploration areas. Gray and humpback whales co-exist with human activities in certain areas, which suggests that some cetaceans can adjust to some levels of noise from boat and air traffic. Above some threshold, increases in ambient noise may have harmful effects. Barge traffic has been observed to disturb beluga whales in the Canadian Beaufort Sea, and Scammon Lagoon in Mexico has been closed to all but local fishing boats because of disturbance to gray whales there. Humpback whales, killer whales and Dall porpoises may have been affected adversely by boat traffic in Glacier Bay, Alaska. The National Park Service has published regulations governing the number of tour ships that may enter Glacier Bay and the speeds and distances that all vessels must observe in the presence of humpback whales. NMFS has published similar guidelines for the humpback whale grounds in Hawaiian waters.

Noise resulting from the construction of gravel islands in the Norton Basin probably would not affect whale behavior and migration since the islands probably would be placed in the shallow southeastern areas of inner Norton Sound where endangered whales usually do not occur. Studies being conducted in the Canadian Beaufort Sea on bowhead whales soon may provide additional information on the effects of noise produced by this activity. To avoid potential impacts construction of gravel islands should not occur when and where whales are present. The NMFS will make recommendations concerning the

[2] Geraci, J.E. and D.J. St. Aubin, 1980. Offshore petroleum resource development and marine mammals: A review and research recommendations. Mar. Fish. Rev., Nov. 1980, pp 1-12.

timing of gravel island construction as appropriate after reviewing USGS exploration plans.

More definitive studies are needed to predict more accurately the nature and extent of impacts to endangered whales from the noise produced by OCS activities on the migration, reproduction, or calving of whales, particularly the bowhead and gray whale. Regulation of aircraft and vessel traffic can ensure that this source of disturbence is minimized.

Physical Impacts:

Temporary gravel islands for exploration, once in place, are not likely to interfere with whale migration or other behavior. Observations in other geographic areas indicate that whale behavior is not disrupted by fixed platforms and islands.

The mooring chains used to position drill ships probably will not have an adverse impact on endangered whales; these chains will be taut, and it is unlikely that whales will become entangled. Reflectors can be mounted to mooring chaines to make them acoustically visible to whales.

Oil and gas exploration in the Bering Sea will result in an increase in ship and boat activities which will result in an increased risk of collisions between vessels and whales. The NMFS believes that the short-term increase in vessel traffic is unlikely to jeopardize the continued existence of any species of endangered whale. Fishing vessel traffic already is high and the additional increase by the petroleum industry operators probably will be minor. Nevertheless, certain areas contain significant numbers of whales, and encounters may be likely. Vessel operators should be advised of such areas and of boat operation procedures that can be used to avoid collisions.

Oil Spills:

Oil spills are not uncommon in OCS operations. The vast majority of these spills involve less than 50 barrels per incident and result in negligible measurable or long-term environmental damage. Large oil spills involving 1,000 or more barrels of oil are infrequent. Catastrophic spills such as an uncontrolled blow-out releasing thousands of barrels of oil into the environment over a period of days or weeks are too rare an event to calculate their probability of occurring with any reliability. Nevertheless, there is the potential for a blow-out to occur.

According to the National Research Council report on "Safety and Offshore Oil"[3] the rates of blow-outs in the past 10 years is 1 per 264 wells drilled in the U.S. waters. Most of these were gas blow-outs, but one well released 53,000 barrels of oil before being controlled. Four blow-outs required relief wells to be drilled to regain control. Exploratory drilling in new environments possesses unknown risks that may increase the potential of a well blow-out. Seasonal restrictions on drilling in certain areas can be used to preclude the possibility of a catastrophic oil spill during times of the year when endangered whale species are numerous and likely to encounter the spilled oil.

Oil spills have the potential to severly affect endangered whales. The magnitude of the impact would depend on the location, size of the spill, and on other environmental circumstances of the spill, conditions which are impossible to forecast. The risk of an oil spill in locations and times of year when whales are abundant should be avoided.

In the unlikely event of an encounter with a major oil spill, cetaceans could be severely affected. An oil spill could damage baleen whale feeding mechanisms, impair vision, and disrupt respiratory and digestive systems.

There is no (available) evidence that indicates whether cetaceans are able to detect and avoid hydrocarbon pollution. Accounts from past oil spills indicate that some marine mammals, for example seals and sea lions, sometimes do not avoid oil; however, no whales, dolphins, or porpoises have been found coated or fouled with oil.[4] Cetacean skin is usually smooth and unlikely to accumulate oil. Those species with major surface irregularities or eroded areas, such as the gray, humpback, and bowhead may retain oil on parts of their bodies. Unlike pinnipeds, whose fur is visibly affected by oil, an oil-fouled cetacean may go unnoticed. Although oil-fouled ceteceans have not been observed, the nature of their skin suggests that they may be particularly vulnerable to noxious effects of surface contact with hydrocarbons. Unlike other mammals, the epidermis of cetaceans is not keratinized, but is composed of living cells that are virtually unshielded from the environment and may be permeable to hydrocarbons. Cetacean epidermis may react to noxious substances, such as oil, in a manner similar to that of sensitive mucous membrances. Physical or chemical disruption by oiling might be expected to have immediate and far-reaching metabolic consequences, perhaps affecting vital ionic regulation and water balance.

Cetacean vulnerability to oil ingestion varies with species, type of oil and nature of the oil spill. Baleen whales such as blue, fin, humpback, and bowhead whales accidentally could engulf large quantities of oil while feeding on plankton concentrations that may be present in an oil spill area. Much of the oil thus engulfed probably would be forced out of the mouth during the feeding process; however, oil coating or fouling of the baleen plates could occur and some oil would be ingested. Studies in progress have demonstrated that oil causes matting of the baleen fringes, which reduces filtering efficiency. Other baleen whales, such as right and sei whales, which skim the water surface and cover relatively large areas while feeding, may be the most vulnerable to baleen fouling and oil ingestion from surface oil pollution. The affect of oil ingestion on whales is unknown.

The bottom-feeding gray whale is unlikely to ingest surface oil but could be prone to ingestion of hydrocarbons in the bottom sediments of nearshore areas that are contaminated by either acute or chronic oil pollution. Cetaceans, especially the benthic feeders, are reported to have a poorly developed sense of taste, as indicated by the presence of foreign material in their stomachs. This evidence implies that some whales may not be able to differentiate between hydrocarbon-contaminated and uncontaminated food.

Inhalation of oil and/or oil clogging of the cetacean blowhole are unlikely as the typical breathing cycle of cetaceans involves an "explosive" exhalation followed by an immediate inhalation and an abrupt closure of the blowhole. This process prevents inhalation of water and, presumably would keep oil from being inhaled. However, the more toxic volatile fractions of oil and hydrocarbon gas could be inhaled. Thus the inhalation of hydrocarbons probably would depend on the quantity and chemical properties of the oil.

The greatest potential indirect impact from oil and gas activities on cetaceans would be the destruction or contamination of critical food sources from acute or chronic oil pollution. Most of the migratory baleen whales (bowhead, fin, gray, and humpback) probably are seasonal feeders and rely on the abundant food sources of northern waters for the bulk of their annual nourishment. They live largely off their stored blubber reserves while migrating and while on their winter ranges.

Euphausiids and copepods are important foods of the bowhead, humpback, fin, blue, sei, and right whales, and benthic amphipods and other invertebrates are important foods of gray whales. The destruction or contamination of these food resources by oil pollution would adversely affect the associated whale species by causing them to migrate to their wintering areas in a lean and probably stressed condition. Inadequate nutrition probably would lead to reduced reproduction success, and increased mortality. Thus it is likely that an oil spill that affected food resources would cause

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[3] National Academy Press, 1981. Safety and Offshore Oil. Committee on Assessment of Safety of Outer Continental Shelf Activities. 332 pp.

[4] Geraci, J.E. and D.J. St. Aubin, 1980. Offshore petroleum resource development and marine mammals: A review and research recommendations. Mar. Fish. Rev., No. 1980, pp. 1-12.

additional stress to an already endangered or depleted whale population. The right, humpback, blue, and bowhead whales are among the most endangered whale species and are also "restricted feeders," depending on an abundance of only a few species of plankton. These whales probably also have the lowest tolerance to increased stress and mortality.

The significant reduction of plankton populations in the Bering Sea as a whole from oil spills is improbable. However, oil spill in a localized feeding area with highly concentrated food resources could lead to localized and temporary loss or contamination of the food resources, and would contribute to adverse environmental stress on these already depleted whale populations. Of particular concern in the Bering Sea are the benthic food resources in localized gray whale feeding areas in Chirikov Basin, Bering Strait, and near St. Lawrence Island.

The bowhead whale and the gray whale would be the most vulnerable to the direct impacts of an oil spill. The bowhead would be most likely affected by an oil spill in the Bering Strait or Norton Basin near St. Lawrence Island during its spring and late fall migrations through these waters, and in the Navarin Basin during the winter. Gray whales are most vulnerable near Unimak Pass in the spring and fall, and in the Bering Strait, Chirikov Basin, and near St. Lawrence Island during the summer.

Cumulative Impacts:

Cumulative effects of the aforementioned impacts are unpredictable at this time. While cumulative impacts are possible, the degree of severity or time it would take to observe any measurable effects cannot be foreseen. NMFS will monitor OCS activities in the Bering Sea Region and review new information concerning endangered whales for indications of cumulative impacts. Studies funded by BLM also may provide information that will help identify such impacts. Should hydrocarbons be discovered in the Bering Sea, or should hydrocarbon exploration continue in combination with extensive development and production of hydrocarbons in any adjacent areas of the OCS, demonstrable cumulative impacts could be produced. Careful attention must be given to the overall population status of these species and the quality of their habitat during the development and production periods in any OCS lease areas.

Conclusions

The NMFS believes that there is insufficient information concerning oil and gas exploration activities in the Bering Sea to allow us to determine whether such activities are likely to jeopardize the continued existence of endangered whales found there. We lack important information regarding the specific details of activities that may occur in individual lease areas (such as acoustic geophysical surveys, locations of leases, and exploration plans, etc.). However, we believe that it should be possible for the BLM and USGS to plan activities during the exploration phase in such a way as to avoid the likelihood of jeopardizing the continued existence of any species of endangered whale. Below we offer some reasonable and prudent alternatives that DOI can now adopt to avoid the possibility of jeopardy to these endangered whales. We emphasize here that it is our belief that DOI plans to reinitiate consultation on all future lease sales in the Bering Sea Region. Such consultations can provide DOI with additional measures that can be taken to ensure that specific OCS exploration activities are not likely to jeopardize the continued existence of any species of endangered whale.

Future actions that may affect endangered whales will require additional consultation pursuant to Section 7(a)(2) of the ESA. These actions will be evaluated as they become known, and we will continue to review, on a case by case basis, results of studies and the necessary federal permit applications required for the OCS activities.

We have based our opinion on the following:

A. Pre-Lease Stage

There probably will be no adverse impacts to endangered whales from the environmental or biological studies conducted in potential lease areas. These activities include trawling, sediment sampling, and bottom-profiling.

Further geophysical seismic exploration is expected in each lease area. At this time, knowledge of future levels of activity is insufficient to predict the magnitude of potential effects on endangered whales of noise from seismic surveys. We are especially concerned that seismic noise may affect the behavior of endangered bowhead and grey whales on their feeding and breeding grounds and along with migratory corridors and could possibly lead to altered distribution patterns and reduced productivity. DOI should review geophysical permit applications to determine if consultation pursuant to Section 7(a)(2) is required. Permit applications should be sent to NMFS' Alaska Office for review and comment.

We assume that COST Wells will be drilled off-structure. Additional consultation under Section 7(a)(2) is required for drilling on-structure COST Wells.

B. Exploration Stage

The type, and number of exploration platforms in an area can only be estimated at this time. Information on the times and locations of these platforms, of the construction of gravel islands, and of drilling activities are needed to predict the effects of exploration activities on endangered whales. Because this information will not be provided until the exploration plans are submitted, all proposed exploration plans and accompanying environmental reports submitted to the DOI must be reviewed to determine if additional Section 7 consultations are required.

The effects of geophysical activities will be the same as discussed for the pre-lease stage.

Endangered Whales Research Needs

Additional biological data also are required before NMFS can render a reliable opinion concerning the likelihood of jeopardy to endangered whales from OCS activities in the Bering Sea. NMFS recognizes BLM's valuable research efforts on endangered whales, particularly the bowhead. We encourage the continuation of this effort. Below we provide DOI with our assessment of the kind and amount of information needed before NMFS can complete a comprehensive Biological Opinion on the question of the likelihood of jeopardy to endangered whales from OCS activities.

The BLM Alaska OCS Office[5] proposes that a key species/key effects approach be employed to obtain information and data sufficient to answer important effects questions. Under that approach, research efforts in the Bering Sea would be directed towards bowheads, gray, fin, and humpback whales. NMFS believes priority consideration should be assigned to research under such a program as given in Table 1. Emphasis should be placed on studying gray and bowhead whales in the Norton Basin, Chirikov Basin, and Bering Strait Regions, humpback, gray, and fin whales in the St. George Basin, gray and humpback whales in the Northern Aleutian Shelf and Unimak Pass, and bowhead whales in overwintering areas in the Navarin Basin. Seasonal distributions, numbers, and habitat uses are needed. Observations on other endangered whale species should be made whenever possible. The BLM should ascertain whether or not the right whale presently occurs in the Bering Sea.

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[5]Draft Technical Paper, "Endangered Species Research: A Rationale For The Selection Of A Research Strategy," by C.J. Cowles and J.L. Imm. BLM/OCS. Anchorage, Alaska.

Table 1. Endangered cetaceans, ranked by research need for four Bering Sea OCS lease areas, based on these criteria: total abundance, dependence on habitat, and susceptibility to location and of activity within or adjacent to lease areas.

Rank	Norton Basin Outer	Norton Basin Inner	St. George Basin	No. Aleutian Shelf	Navarin Basin
1	Gray	Bowhead	Humpback/Gray	Gray	Bowhead
2	Bowhead	Gray	Fin	Humphack	Fin
3	Fin	-	Sei/Blue/Right	Fin	Humpback
4	Humpback	-	Sperm	Right	Sperm

Major data gaps exist on the effects of oil and associated OCS activities on cetaceans. Studies are needed to determine the effects of various sound frequencies and levels emitted from industry operations on the behavior of the whales. Research should continue to evaluate the impacts resulting from human activity and, to a lesser extent, offshore structures on whale populations. The effects of oil spills on cetaceans are still not understood. Studies currently conducted or funded by BLM have begun to address these problems, and meaningful results should become available within the next few years.

The NMFS believes that the question of cumulative impacts deserves considerably more attention than it has been given to date. We are especially concerned that the bowhead whale is potentially subject to any adverse effects that may be associated with OCS oil and gas activity throughout its entire Alaska range as well as in its summer habitats in Canadian waters. Risks to this whale from noise and other potential sources of behavioral disturbance, oil spills, and habitat displacement should be assessed from the perspective of its complete habitat range rather than on a lease area by lease area basis. To accomplish this will require substantially better knowledge of the biology and habits of this whale throughout its range and over its entire life cycle. Information on cumulative effects will become particularly critical as the development and production stages are approached in the Bering Sea and Arctic lease areas. In particular, knowledge of recruitment, habitat use patterns

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adjacent to proposed lease areas, and knowledge of variations in habitat partitioning among areas by season are needed in order to help determine and predict impacts, if any, to the segment of the population affected.

Reasonable Prudent Alternatives

Despite our inconclusive Biological Opinion the NMFS believes that DOI can presently plan OCS activities to avoid the likelihood of jeopardizing the continued existence of endangered whales in the Bering Sea Region. Here we offer DOI reasonable and prudent alternatives to help DOI meet this goal.

We are unable, at this early stage in the OCS process, to provide detailed alternatives for each of the four Bering Sea lease areas. Additional consultations will be needed as more detailed information is made available on the locations, timing and nature of each proposed lease area activity and on endangered whales in these lease areas. Sale notices, and subsequent exploration plans and permit applications should be reviewed by DOI on a case-by-case basis as activities are proposed to determine if additional Section 7 consultation is needed.

At this time reasonable and prudent alternatives that should be incorporated into the OCS leasing process or included in leases to avoid impacts and to ensure protection of endangered whales during the lease sale exploratory phase of the oil and gas activities are as follows.

1. Leasing should not take place in the Bering Strait and Chirikov Basin. The Bering Strait is extremely important as a migratory corridor for the entire bowhead whale population (April through May, and November through December), for a substantial part of the gray whale population (May through October). Both the Bering Strait and Chirikov Basin are important feeding habitats which are extensively occupied by gray whales from May through October.

2. Seasonal drilling restrictions should be placed on leases in the following areas. Sufficient time must be included in the seasonal restrictions to allow for drilling of relief wells and oil spill clean-up before the endangered whales re-enter each area.

a. There should be no drilling in the moving pack ice zone of Norton Basin during the winter and spring seasons (November 1 through May 31). This restriction would protect the bowhead whale from the risk of an oil spill in leads and the moving pack ice where it would be impossible to clean-up. Oil from a spill in these areas could be transported with the pack ice to bowhead overwintering areas near St. Lawrence Island, or may be encountered in the lead systems by these whales on their northward spring migration.

b. Exploratory drilling in the Navarin Basin area should be prohibited during the winter and spring months (December 1 through May 31) when pack ice is formed and overwintering bowhead whales are present in the area. Drilling should be limited to the ice-free season (June 1 through November 30).

c. Drilling in the vicinity of Unimak Pass should be prohibited during the spring (April 1 to June 30) and fall months (November 1 to January 31) when the entire gray whale population migrates through these waters.

3. Aircraft and vessel traffic should be controlled to avoid disturbances to endangered whales.

Recommendations

Section 7(a)(1) requires Federal agencies to utilize their authorities in furtherance of the purposes of ESA by carrying out programs for the

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conservation of endangered and threatened species. To help DOI meet this obligation with respect to OCS activities in the Bering Sea Region NMFS offers the following recommendations:

1. We recommend that the BLM continue their studies in the distribution, abundance and habitat use of endangered whales in the Bering Sea.

2. We recommend that the BLM continue studies to gather information on the imacts of oil spills on endangered whales as well as on the effects of noise on these species.

3. Since the occurrence and distribution of cetaceans in the Bering Sea is not well known, NMFS desires to expand the existing data base. We believe that exploratory activities furnish an excellent opportunity for obtaining data on endangered whales, and therefore request that all sightings during exploration activities be reported to NMFS Alaska Regional Office. NMFS will furnish identification guides.

4. We recommend that the BLM and USGS establish for the Bering Sea Region a Biological Task Force, of which NMFS will be a member, to assist the DOI in OCS-related decisions that may affect endangered species and other biological resources of this Region.

5. Lessees should be notified, through information contained in the Notice of Sale and the lease, of guidelines that operators should use to avoid any potential problems of harassment or physical harm to these cetaceans. Appendix II provides guidelines to vessel and aircraft operators to avoid harassing endangered whales.

Opportunities for Additional Consultation

DOI has indicated that consultation will be reinitiated for individual lease sales to be held in the Bering Sea Region. During the post-lease exploration phase, the DOI has agreed to provide NMFS with all exploration plans, and any subsequent revisions of such plans. DOI should review these plans to determine if further Section 7 consultation is necessary.

Consultation under Section 7 will be reinitiated upon commencement of the development and production phase in any of the Bering Sea lease areas. At such time, any additional information available on the potential impacts of endangered whales will be re-evaluated, details on the location and magnitude of OCS development will be gathered, and a new Biological Opinion will be issued.

Consultation also must be reinitieted if: new information reveals impacts of the proposed activities that may affect listed species; the identified activities are modified in a manner not considered herein; or a new species is listed or critical habitat is designated that may be affected by the proposed activities.

This biological opinion in no way permits the taking of any endangered or threatened species. Taking of such species is prohibited under Section 9 of ESA and is subject to prosecution unless permitted pursuant to Section 10(a) of ESA or by regulation.

TABLE A. Eastern North Pacific endangered whales occurring in or adjacent to OCS lease areas in the Bering Sea. Codes are: 1 - Important seasonally; 0 - Occasional, not normal habitat; R - Rare; N - Not present; Blank - no data. From Howard Braham, personal communication.

Species	Population Size 1/	Status	LEASE AREAS: St. George Basin (70)	No. Aleutian Shelf (75)	Navarin Basin (83)	Norton Sound 4/ Outer	Norton (57) 5/ Inner
Bowhead	2,300	Stable or decreasing slightly	R	N	1	1	1
Gray	15,000+	Stable or increasing slightly	1	1	0	1	0
Fin	17,000	?	1	1	1?	0	0
Humpback	1,200	?	1	0	0	0	N
Blue	1,700	?	0	0?	R	N?	N?
Sei	9,000	?	0	0	0	R	N?
Right	200	?	1	0?	0?	N 2/	N
Sperm	200,000	?	0	N	0 3/	N	N

1/ Eastern North Pacific population sizes, Bering Sea components may be considered small for all but bowhead and gray whales.
2/ Formerly occurred in Norton Sound area.
3/ Edge of continental shelf, and in deeper water.
4/ West of 166°W longitude.
5/ East of 166°W longitude.

Appendix I

Endangered Whales Occurring in the Bering Sea

Eight species of endangered cetaceans may occur in the four proposed lease areas in the Bering Sea. These are the bowhead, gray, fin, humpback, blue, sei, right, and sperm whales. Information relating to population size, status, and occurrence of each species in the various lease areas is summarized in Table A.

Bowhead Whale:

The bowhead whale (*Balaena mysticetus*) is one of the rarest and one of the least known of the great whales. These ice-associated whales inhabit Arctic waters during the summer and Bering Sea waters in the winter. Bowhead whales pass through the Bering Strait and enter the Bering Sea in late fall, in advance of the winter extension of the arctic pack ice. From about November to April or May, the entire population of bowhead whales, estimated at about 2,300 individuals, may occupy the broken pack ice of the central Bering Sea. The exact location of the wintering area is poorly documented, but appears to extend from south and west of St. Lawrence Island to as far as the ice front edge, and perhaps occasionally farther south into open water. Their over-wintering range probably varies with the type and extent along the 100 to 200 m depth contour at the continental shelf edge. During 1979

ice-breaker surveys, bowhead whales were seen in the vicinity of St. Matthew Island among broken ice up to 8/10 coverage as well as in polynyas south and west of St. Lawrence Island.

In spring the whales move through the broken ice and small open leads around St. Lawrence Island, travel northward through the outer Norton Sound area and pass through the Bering Strait on their migration to summering areas in the Arctic.

The nature of winter activities of bowhead whales in the Bering Sea is generally unknown. Mating and calving are believed to occur in the spring and may occur in the central and northern Bering Sea, as well as in the Chukchi and Beaufort Sea, during or prior to the commencement of the spring migration. The growth trend of the population is uncertain.

Gray Whale:

The gray whale, *Eschrichtius robustus*, has an eastern Pacific population that migrates from its wintering areas of Mexico to summer in the Bering and Chukchi and occasionally the Beaufort Seas. The spring migration of these whales through Alaska waters and into the Bering Sea follows the coastline close to shore. Whales first appear in the Gulf of Alaska from June to July. Inside the Bering Sea, the gray whales follow the Bristol Bay coast to the vicinity of Nunivak Island. From Nunivak Island they move offshore to their northern feeding areas.

Virtually the entire population of 15,000+ animals summer in the Bering and Chukchi Seas. Large concentrations of gray whales (5000+) occur from north of St. Lawrence Island to the Bering Strait from May to November where the waters of the major feeding areas are relatively shallow (20-60m). Some animals continue north through the Bering Strait into the Chukchi and shallow Arctic Seas. A small portion of the gray whale population summers in the southern Bering Sea, particularly near the Pribilof Islands.

The population of gray whales appears to be slightly increasing.

Fin Whale: The fin whale, Balaenoptera physalus, summers in the Bering Sea, occasionally as far north as the Chukchi Sea, and migrates to more southern latitudes in winter to mate and calve. The North Pacific population is currently numbered at 17,000 but it is unknown how many of these animals seasonally inhabit the Bering Sea. The growth trend of the population is unknown. Fin whales entering the Bering Sea are apparently composed of two groups; one of mainly mature whales and females without calves which follows the outer shelf edge to as far west as Cape Navarin; and a group of mainly nursing females and immatures which stays in the southern Bering Sea Region north of Unimak Pass. They are present during the summer in low numbers in outer Norton Basin and around St. Lawrence Island.

Humpback Whale:

The humpback whale, Megaptera novaeangliae, has a distribution similar to the fin whale. In the summer a portion of the population enters the Bering and Chukchi Seas, where these whales may spend up to 5-1/2 months on their feeding grounds. Their present North Pacific population is estimated at only 1,200 animals, and the condition of this population is uncertain. They often occur during summer and fall in the St. George lease area and adjacent waters, and may occasionally be encountered in other parts of the Bering Sea.

Blue Whale:

The blue whale, Balaenoptera musculus, probably rarely enters the Bering Sea; the few that do have been reported as far north as the Bering Strait. Most records for the Bering Sea are from off the continental shelf south of the Pribilof Islands.

Sei Whale:

The sei whale, Balaenoptera borealis, sometimes enters the southern Bering Sea, but are rarely encountered and little is known of their distribution in these waters. They have been reported from southwest of St. Lawrence Island and along the continental shelf edge. They are rare or absent from the northern Bering Sea Region.

Right Whale:

The right whale, Balaena glacialis, is nearly extinct in the North Pacific from over-exploitation by commercial whaling. The population may be below the critical number from which recovery can be expected. Only 200 animals are estimated to remain in the North Pacific. Sightings are exceedingly rare and little is known about the present distribution. St. Lawrence Island may be the northern limit of this species. Most Bering Sea sightings have been in July between the Pribilof Islands and the Aleutian Archipelago, mainly of single individuals.

Sperm Whale:

Sperm whales, Physeter macrocephalus, migrate to northern latitudes in the summer. Generally only males reach Alaska waters, the females and immatures are generally found farther south between 40° and 50°N latitude, but may enter

the Bering Sea during warm years. Male sperm whales are relatively abundant in the central Bering Sea to as far as 62°N latitude and are known to occur there from April to September. The main area of concentration appears to be along the continental slope between the Pribilof Islands and Cape Navarin, especially in the vicinity of 180°W longitude.

Appendix II

The Endangered Species Act prohibits harassment of endangered and threatened species whether the harassment occurs through an intentional or negligent act or omission. Harassment refers to conduct or activities that disrupt an animal's normal behavior or cause a significant change in the activity of the affected animal. In many cases the effect of harassment is readily detectible: a whale may rapidly dive or flee from an intruder to avoid the source of disturbance. Other instances of harassment may be less noticeable to an observer but will still have a significant effect on endangered whales.

Leaseholders must be prepared to take all reasonable and necessary measures to avoid harassing or unnecessarily disturbing endangered whales. In this regard, leaseholders should be particularly alert to the effects of boat and airplane or helicopter traffic on whales.

In order to insure that leaseholders may derive maximum benefits from their operations at a minimum cost to the health and well being of endangered whales, the following guidelines are offered to help avoid potential harassment of endangered whales.

(1)(a) Vessels and aircraft should avoid concentrations or groups of whales. Operators should, at all times, conduct their activities at a maximum distance from such concentrations of whales. Under no circumstances, other than an emergency, should aircraft be operated at an altitude lower than

1,000 feet when within 500 lateral yards of groups of whales. Helicopters may not hover or circle above such areas or within 500 lateral yards of such areas.

(b) When weather conditions do not allow a 1,000 foot flying altitude, such as during severe storms or when cloud cover is low, aircraft may be operated below the 1,000 foot altitude stipulated above. However, when aircraft are operated at altitudes below 1,000 feet because of weather conditions, the operator must avoid known whale concentration areas and should take precautions to avoid flying directly over or within 500 yards of groups of whales.

(2) When a vessel is operated near a concentration of whales the operator must take every precaution to avoid harassment of these animals. Therefore, vessels should reduce speed when within 300 yards of whales and those vessels capable of steering around such groups should do so. Vessels may not be operated in such a way as to separate members of a group of whales from other members of the group.

(3) Vessel operators should avoid multiple changes in direction and speed when within 300 yards of whales. In addition, operators should check the waters immediately adjacent to a vessel to ensure that no whales will be injured when the vessel's propellors [or screws] are engaged.

(4) Small boats should not be operated at such a speed as to make collisions with whales likely. When weather conditions require,

(4) Small boats should not be operated at such a speed as to make collisions with whales likely. When weather conditions require, such as when visibility drops, vessels should adjust speed accordingly to avoid the likelihood of injury to whales.

When any leaseholder becomes aware of the potentially harassing effects of lease operations on endangered whales, or when any leaseholder is unsure of the best course of action to avoid harassment of endangered whales, every measure to avoid further harassment should be taken until the National Marine Fisheries Service is consulted for instruction or directions. However, human safety will take precedence at all times over the guidelines and distances recommended herein for avoidance of disturbance and harassment of endangered whales.

Leaseholders are advised that harassment of endangered whales may be reported to the National Marine Fisheries Service for further action, including prosecution, under the Endangered Species Act of 1973.

Attachment 2
Guidelines to Vessel and Aircraft Operators

The Endangered Species Act prohibits harassment of endangered and threatened species whether the harassment occurs through an intentional or negligent act or omission. Harassment refers to conduct or activities that disrupt an animal's normal behavior or cause a significant change in the activity of the affected animal. In many cases the effect of harassment is readily detectible: a whale may rapidly dive or flee from an intruder to avoid the source of disturbance. Other instances of harassment may be less noticeable to an observer but will still have a significant effect on endangered whales.

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(b) When weather conditions do not allow a 1,500 foot flying altitude, such as during severe storms or when cloud cover is low, aircraft may be operated below the 1,500 foot altitude stipulated above. However, when aircraft are operated at altitudes below 1,500 feet because of weather conditions, the operator must avoid known whale concentration areas and should take precautions to avoid flying directly over or within 500 yards of groups of whales.

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
1011 E. TUDOR RD.
ANCHORAGE, ALASKA 99503
(907) 276-3800

IN REPLY REFER TO:

SE

04 NOV 1983

Mr. David Russell
Director
Minerals Management Service
MMS-Mail Stop 644
12203 Sunrise Valley Drive
Reston, Virginia 22091

Dear Mr. Russell:

This responds to your September 28, 1983, request to reinitiate formal consultation pursuant to Section 7(a) of the Endangered Species Act (ESA), as amended, for Outer Continental Shelf (OCS) oil and gas leasing and exploration in the St. George Basin (Lease Sale No. 70) and the Northern Aleutian Shelf (Lease Sale No. 75).

BACKGROUND

A Biological Opinion and an amended Biological Opinion were issued on August 22, 1980, and September 16, 1980, respectively for the Bering Sea Region (copies attached). Your reason for reinitiating consultation is to ensure that conclusions contained in the earlier opinions are still valid in view of newly obtained information relative to these proposed sales.

BIOLOGICAL INFORMATION

The American and Arctic peregrine falcons (Falco peregrinus anatum and F. p. tundrius) short-tailed albatross (Diomedea albatrus) and Eskimo curlew (Numenius borealis) are endangered species considered in the 1980 opinions. There is no new information on the occurrence of these birds within the lease offering areas and we find the 1980 opinions to be current and entirely appropriate for these species.

During the summers of 1982 and 1983 new information on the endangered Aleutian Canada goose (Branta canadensis leucopareia) was obtained. A remnant nesting population of Aleutian Canada geese was discovered on Chagulak Island, an island in the southwest corner of the St. George Basin lease area, in the Islands of Four Mountains group.

The probability of an oil spill during exploration is minimal. Oilspill trajectory data indicate that the net transport of oil due to an oilspill within the St. George Basin lease area would probably be northward away from Chagulak Island. In addition, Aleutian Canada geese nest in terrestrial habitat at high elevations and seldom frequent estuarine habitat during the nesting season.

There have been unconfirmed sightings of fall migrating geese at Unimak Island. However, in a continuing migration study where leg banding and color marking has been used since 1974, there has never been a documented return or sighting of an Aleutian Canada goose, in Alaska, east of the Andreanof Islands. All data indicate that the geese migrate in the spring and fall directly over water between the outer Aleutian Islands (west of Unimak Pass) and the wintering areas in California. It appears, therefore, that migrating Aleutian Canada geese do not traverse the proposed lease areas.

BIOLOGICAL OPINION

Based on this information, it is my Biological Opinion that the proposed oil and gas leasing and exploration activities in the St. George Basin and in the Northern Aleutian Shelf are not likely to jeopardize the continued existence of the endangered Aleutian Canada goose, or the other endangered species previously considered.

This opinion does not address oil or gas development or production. Consultation will be required prior to start up of those phases. New information which could alter this Biological Opinion, the listing of new species which could be affected by the proposed action, or significant modification of the proposed action, will also require reinitiation of consultation.

Thank you for your cooperation and for your concern for endangered species.

Sincerely,

Acting Regional Director

Attachments

United States Department of the Interior

FISH AND WILDLIFE SERVICE
1011 E. TUDOR RD.
ANCHORAGE, ALASKA 99503
(907) 276-3800

IN REPLY REFER TO:
SE

10 NOV 1983

Mr. David Russell
Director
Minerals Management Service
EMS-Mail Stop 644
12203 Sunrise Valley Drive
Reston, Virginia 22091

Dear Mr. Russell:

Attached are copies of letters that we failed to attach to our November 4, 1983, Biological Opinion for the Outer Continental Shelf oil and gas leasing and exploration in the St. George Basin and the Northern Aleutian Shelf.

Please excuse this inconvenience.

Sincerely,

Keith M. Schreiner
Regional Director

Attachments

OFFICE COPY

AUG 22 1980

In Reply Refer To:
FWS/OES BLM/CS-80-2

Memorandum

To: Director, Bureau of Land Management
Director, U.S. Geological Survey

From: Associate Director

Subject: Biological Opinion Regarding Outer Continental Shelf (OCS) Oil and Gas Leasing and Exploration Activities in the Bering Sea Region

By memorandum received June 6, 1980, the Bureau of Land Management (BLM) and the U.S. Geological Survey (GS) requested a joint formal consultation on the proposed Outer Continental Shelf (OCS) oil and gas program in the Bering Sea region. Four proposed OCS lease Sales are scheduled to take place in this region between September 1982 and December 1984. This consultation considers oil and gas leasing and exploration activities in the area that encompasses proposed Sales 57 (Norton Basin), 70 (St. George Basin), 75 (Northern Aleutian Shelf), and 83 (Navarin Basin). By memorandum dated June 19, 1980, a list of four species which may be affected by the OCS programs was received from the BLM Alaska OCS Office, including the American and Arctic peregrine falcons (*Falco peregrinus anatum*, *F. p. tundrius*), short-tailed albatross (*Diomedea albatrus*), Aleutian Canada goose (*Branta canadensis leucopareia*), and Eskimo curlew (*Numenius borealis*).

Through informal consultation, agreement was made that the only "may affect" situation associated with the leasing and exploration activities would be for Sale #57 (Norton Basin). The affect would be possible disturbance of nesting peregrines along the coast near Nome by aircraft (primarily helicopters) supplying and servicing exploration activities. Similar work activities involving support and supply bases in Dutch Harbor, Cold Bay, and St. Paul will not adversely affect listed species or associated Critical Habitat. There is limited knowledge concerning current peregrine nesting areas in the Bering Sea region. However, BLM will be supplying such information by conducting a survey in the Sale #57 area this summer and the results of that survey should be available by September or October at the latest. If nesting birds are present this formal consultation must be reinitiated.

Neither the short-tailed albatross nor the Eskimo curlew have been recently reported in or near the Bering Sea Sale areas. Probably the most vulnerable habitat of the Aleutian Canada goose would be Buldir Island. However, net transport of oil spills in this region would likely be northward, away from Buldir Island. In addition, large distances between Buldir Island and the lease areas would allow substantial weathering of spilled oil. Thus, there appears to be little chance of spilled oil reaching Buldir Island, the only known nesting area for the species. Therefore, the only species included in this biological opinion are the American and Arctic peregrine falcons (*Falco peregrinus anatum* and *F. p. tundrius*), for which a summary of the biological data is provided below.

American and Arctic Peregrine Falcons (*Falco peregrinus anatum* and *F. p. tundrius*)

The peregrine is a medium-sized falcon. Both of these subspecies have been listed as Endangered since 1970 and Critical Habitat for the American falcon has been designated in California.

The principal cause of the peregrine's decline has been contamination by chlorinated pesticides. Other factors contributing to their decline include shooting, predation (by great horned owls in particular), egg collecting, disease, falconers, human disturbance at nesting sites, and loss of habitat to human encroachment.

The Arctic peregrine breeds in the North American tundra, and migrates mainly along the east coast where it is the most common of the two subspecies. While a few pair of American peregrines still breed in Labrador, the Eastern U.S. population of American peregrines is considered to have been extirpated. However, as a result of the captive breeding program at Cornell University, peregrine falcons have been reintroduced in the Northeastern U.S. There are indications that this reintroduction effort may be successful, and that someday breeding pairs may again occur in the Eastern U.S.

During migration, coastal habitats are used extensively by peregrine falcons. Peregrines can also be found as far as 300 miles offshore during the migration period. Since they are capable of feeding while in flight, it is possible that spills which remain offshore can result in the oiling of peregrines or their prey. In addition, peregrines which rest on beaches during migration may become oiled. The probability of a spill occurring during exploration activities, however, is very remote. The expansion of existing facilities, the establishment of new facilities, or the construction of gravel islands may impact this species and will require reinitiation of consultation before a Corps of Engineers Section 10 permit can be issued.

Since nesting and migration areas are relatively distant from the project area and the potential for an oil spill resulting from exploration activities is small, it is my biological opinion that the proposed oil and gas leasing and exploration activities associated with proposed OCS Sales 57, 70, 75, and 83 are not likely to jeopardize the continued existence of the listed species considered herein, and because there is no designated Critical Habitat within or near the project area, Critical Habitat will not be affected.

Should the use or expansion of other facilities is proposed or should the initiation of activities (such as the construction of gravel islands for exploration purposes) not specifically mentioned in this consultation are proposed, reinitiation of Section 7 consultation will be required. Since development/production activities may affect listed species, Section 7 consultation will be required before this phase is entered. If a new species which may be affected should be listed, or additional pertinent information becomes available, or the project description change, Section 7 consultation must be reinitiated.

We would like to thank BLM and GS for their consideration in providing the necessary information needed to conduct this consultation.

/S/ Ronald E. Lambertson

cc: Directorate Reading File
DD Chron
AFA Reading File

FWS/OES:LWest:ad 7/18/80 235-2760 final 8/12/80

United States Department of the Interior

FISH AND WILDLIFE SERVICE

FISH AND WILDLIFE SERVICE
WASHINGTON, D.C. 20240

In Reply Refer To:
FWS/OES BLM/GS-30-2

Memorandum

SEP 16 1980

To: Director, Bureau of Land Management
Director, U.S. Geological Survey

Acting Associate
From: Director

Subject: Revision of August 22, 1980, Biological Opinion Regarding Outer Continental Shelf (OCS) Oil and Gas Leasing and Exploration Activities in the Bering Sea Region

Recent information from Dennis Money, Alaska Area Office, indicates that the peregrine nesting survey in the Sale #57 (Norton Basin) area of the Bering Sea cannot be accomplished for 1980. Therefore, the subject biological opinion should be amended to read as follows:

1. Page 1. Paragraph 2. Delete lines 7-12 "There is limited knowledge... formal consultation must be reinitiated."

2. Incorporate the following statements as the first paragraph on page 3.

   To assist you in exercising your authority for the conservation of listed species, the following actions are recommended:

   a. Aircraft supplying and servicing exploration activities must maintain at least 1500 feet altitude above nest level within 1 mile horizontal distance of peregrine falcon eyries identified in past surveys in the Sale #57 (Norton Basin) area. The U.S. Fish and Wildlife Service, Alaska Area Office, should be contacted to determine the location of these historical eyries.

   b. A complete updated survey delineating current peregrine nesting areas in the Sale #57 area should be completed no later than October 1981. If nesting birds are present this formal consultation must be reinitiated.

The revised biological opinion is attached.

Harold J. O'Connor

Attachment

cc: Directorate Reading File
DD Chron File - AFA File
[illegible]

APPENDIX I

Alternative-Energy Sources as an Alternative to the OCS Program

Prepared by

Minerals Management Service

Alternative-Engergy Sources as an Alternative to the OCS Program

To delay or eliminate the proposed sale in part or in whole, would reduce future OCS oil and gas production, necessitate escalated imports of oil and gas, and/or require the development of alternate-energy sources to replace the energy resources expected to be recovered if the proposed sale takes place.

The oil and gas that could become available from the proposal over the time period could add to national domestic production. If this proposed sale were cancelled, an additive impact of greater oil and gas deficits could be expected to result in increased imports. If the subject sale were cancelled, the following energy actions or sources might be used as substitutes. However, some of these actions are not feasible at this time and may not be during the estimated life of this production area.

It is anticipated that the oil and gas which would become available from this proposal in the assumed time period could provide a significant contribution to this region's energy supply; if the subject sale were cancelled, the following energy actions or sources might be used as substitutes:

- Energy conservation
- Conventional oil and gas supplies
- Coal
- Nuclear power - fission
- Nuclear power - fusion
- Oil shale
- Tar sands
- Hydroelectric power
- Solar energy
- Energy imports
    - Oil imports
    - Natural-gas pipeline imports
    - Liquefied-natural-gas imports
- Geothermal energy
- Other energy sources
- Combination of alternatives

This section briefly discusses these alternatives. For more detailed information on each of these energy sources and environmental effects, refer to Energy Alternatives: A Comparative Analysis (University of Oklahoma, 1975), prepared for the Bureau of Land Management by the Science and Public Policy Program of the University of Oklahoma.

Energy Conservation: Vigorous energy conservation is an alternative that warrants serious consideration. Several studies have suggested that we could enjoy the same standard of living and yet use 30 to 50 percent less energy than we do now (Lansberg et al., 1979). Aside from these savings, it is now widely recognized that wasteful consumption habits impose social costs that can no longer be afforded, as do pollution and an inequitable distribution of fuel. Existing conservation programs include education, research and development, regulation, and subsidies.

The residential and commercial sectors of the economy are often characterized as inefficient energy consumers. Inadequate insulation, inefficient heating and cooling systems, poorly designed appliances, and excessive lighting are often noticed in these sectors. Reductions in consumption beyond those induced by fuel-price increases could be achieved by new standards on products and building and/or subsidies and incentives. Such incentives include standards for improved thermal efficiency in existing homes and offices and minimum thermal standards for new homes and offices.

Excessive consumption is also evident in the industrial sector, where energy-inefficient work schedules, poorly maintained equipment, equipment with extremely low-heat-transfer efficiencies, and unrecycled heat and waste materials are all commonplace.

Transportation of people and goods accounts for approximately 25 percent of nationwide energy use. Energy inefficiency in the transportation sector varies directly with automobile usage. Automobiles, which account for the bulk of all passenger movement in the nation, use over twice as much energy per passenger mile than buses do. Short- and midterm conservation measures, such as consumer education, lower speed limits, and rate and service improvements on public transit, and rail-freight transit may achieve considerable energy savings.

Other policies which could encourage fuel conservation in transportation include standards for more efficient new automobiles and incentives to reduce miles traveled. An important new development in the fuel economy area could be the modification of the standard internal-combustion engine. Although such an engine is now in the advanced stages of development, further study by automotive engineers, industry, and concerned federal agencies is necessary before an acceptable engine can be designed.

Significant energy savings are clearly possible through accelerated conservation efforts. In addition, several of the strategies mentioned above have been at least partially implemented by the Energy Policy and Conservation Act of 1975 (P.L. 94-163).

Environmental Effect: The environmental effects of a vigorous energy conservation program will be primarily beneficial. The exact nature and magnitude of these effects will depend on whether there is a net reduction in energy use or whether the reduction is accomplished through technological change and substitutions. For the former, the net effects will mean that fewer pollutants of all kinds will be unleashed. As an example, a 2.2-million-barrel/day savings would result in a diminishment nationwide of various pollutants by the following amounts (HUD Contract #H2026R: "Research Evaluation of a System of Natural Air Conditioning"):

Pollutant	Amount of Pollutant Per 1,000 gallons (lbs)	Tons of Pollutant per day
CO	4	189
Hydrocarbons	3	142
Particulates	23	1,088
NO_x	60	2,838
SO_x	157	7,426

However, if energy conservation is achieved by technological change or substitution, the net reductions also will be those above. Other effects could be related or attributed to an OCS lease sale in another unidentified area or as described below.

Conventional Oil and Gas Supplies: Large quantities of oil and gas still remain in the United States. Between 1955 and 1969, the U.S. had slightly increasing amounts of proved oil reserves of about 30 billion barrels. The discovery at Prudhoe Bay in 1970 raised the amount to 40 billion barrels, but reserves have been declining ever since. Since 1970, new oil discoveries have replaced less than half of production. Reserves are currently at the lowest level since 1951. U.S. production has been fairly constant since the mid-1960's at 8 to 9 million barrels daily. Similar patterns occur for natural gas. Proved reserves are currently estimated at 31.4 billion barrels of oil and 208.0 trillion cubic feet of natural gas.

Ultimately recoverable resources (all deposits known or believed to exist in such forms that economic extraction is currently or potentially feasible), in addition to proved reserves, are estimated to be about 82.6 billion barrels of oil (54.6 onshore/28.0 offshore), 13 years of consumption at current rates, and 593.9 trillion cubic feet of natural gas (426.9 onshore/167.0 offshore). This estimate is rising over time, mainly because of higher prices and new discoveries in unexplored areas. Unconventional hydrocarbons and recovery methods, especially enhanced recovery, could more than double these figures. The amount of ultimately recoverable reserves will depend on price, technology, geological information, and public policy such as price controls, access to federal lands, and environmental standards.

Petroleum production is severely constrained in the short run, and greatly affected by world prices in the long run. Although the long-run demand for fuel liquids is not forecast to decline significantly (feasible solid and gaseous substitutes do not appear to exist), consumption of conventional crude oil is expected to decline significantly, as synthetic liquids are produced from shale, tar sands, coal; biomass sources are utilized; and industry and utilities retire oil facilities and shift to coal and possibly nuclear power (Table I-5). Synthetic liquid from coal is expected to be the major source of liquid fuel by 2020, supplying 50 percent of all liquid fuel and 10 percent of all energy consumed.

The following table displays the dimensions of the projected decline in conventional crude oil demand (Table I-5):

	1980	2020
Quads of Conventional Crude Oil Consumed	34	8
As Percentage of Total Energy Consumption	45%	6%
Quads of Liquid Fuel Consumed	34	30
As Percentage of Total Energy Consumed	45%	21%

Conventional natural-gas consumption is expected to decline due to depletion, higher prices, and competition with synthetic gas from coal. Enhanced gas recovery from unconventional sources such as tight sands and Devonian shale is expected to make a significant contribution to gaseous fuel production, providing 50 percent of all gaseous fuel and 5 percent of all energy consumption by 2020. Ultimately recoverable reserves from such sources are estimated at 3,000 trillion cubic feet. The following table displays the dimensions of the projected decline in gaseous fuel demand (Table I-5):

	1980	2020
Quads of Conventional Natural Gas Consumed	20	6
As Percentage of Total Energy Consumption	26%	4%
Quads of Gaseous Fuel Consumed	20	15
As Percentage of Total Energy Consumption	26%	11%

A detailed description of the crude oil and natural gas systems is found in Chapters 3 and 4 of Energy Alternatives: A Comparative Analysis.

To substitute directly for the subject sale, a combination of onshore and OCS production from other areas and continued foreign imports would be required to make up for the estimated total production of this proposed sale.

Environmental Effect: This substitution would entail environmental effects such as land subsidence, soil sterilization, and disruption of existing land-use patterns. Equipment failure, human error, and blowouts also may impair environmental quality. Moreover, poor well construction, particularly in older wells, and oil spills can result in ground- and surface-water pollution.

The water pollutants from onshore oil production are oil and dissolved solids. The amounts of each vary over a wide range. A summary of onshore oil pollutants is available in Energy Alternative: A Comparative Analysis.

Air pollutants (particulates, NO_x, hydrocarbons, and CO) result from blowouts and subsequent evaporation and burning. These are generally insignificant, except locally. These effects will be basically the same, whether the production is onshore or offshore.

Given the fact that onshore supplies are dwindling, users of hydrocarbons from this proposal would have to continue their reliance on other regions and foreign imports for needed oil and gas. The decline in these supplies, even with energy conservation, could mean industrial shutdowns, increased unemployment, higher consumer prices, and changes in the standard of living. The lack of natural gas will mean additional use of "dirtier" alternative fuels (oil, coal) with consequent effects on air quality and human health.

Coal: Coal is the most abundant energy resource in the United States. Proven domestic reserves of coal are estimated at 438 billion short tons. This constitutes over one-quarter of the known world supply, 80 percent of proven U.S. fuel reserves, and 130 times the energy consumed in 1980. Ultimately recoverable reserves are estimated at 3.9 trillion short tons. A detailed discussion of the coal resource system can be found in Chapter 1 of Energy Alternatives: A Comparative Analysis.

Coal production (18.88 quads), consumption (15.67 quads), and inventories (203.6 million short tons) were at record levels in 1980, mostly as a result of increased demand from the electric utilities, including the conversion of existing power-generating units from oil to coal. The 7-percent increase in coal production over 1979 is the main reason for the U.S.'s record energy production in 1980.

Although domestic coal reserves could easily replace the energy expected to be realized from the proposed sale, serious limitations to coal development exist. In many uses, coal is an imperfect substitute for oil or natural gas. In many other cases, coal use and production is restricted by government constraints, limited availability of low-sulfur deposits, inadequate mining, conversion and pollution-abatement technology, and the hazardous environmental effects associated with coal extraction and from electricity generation. Coal production is also threatened by a unique set of labor problems associated with mining, and new, strict standards for coal-mine safety.

Due to its relative price advantage over other fuels, competitive market structure, and large resource base, coal consumption and production are expected to increase significantly and become the primary domestic-energy source in the future (Table I-5). Synfuels from coal also will be important (see below).

The Powerplant and Industrial Fuel Use Act of 1978 was designed to reduce petroleum and natural-gas consumption and to encourage greater use of coal and alternative fuels. The Act prohibits all new electric powerplants and large industrial boilers (and existing ones after 1990) from consuming oil or natural gas as a primary-fuel source unless an exemption is granted.

Although U.S. coal resources are very large, as with other extractable mineral fuels, there is some geographic dislocation. Most of our new low-sulfur coal is found west of the Mississippi River or in Alaska, far from industrial areas. Also, much of the western coal is in arid or semi-arid areas where scarcity of water could constrain development.

If an alternative to the proposed OCS sale is greater reliance on coal, it may be expected that mining would have to increase in western states to provide the necessary fuel resources.

Environmental Effect:

Coal Utilization: Combustion of coal results in various emissions, notably SO_2 and particulates. If the expected production from this sale is replaced by coal, there would be an increase in these pollutants, especially if coal is substituted for the natural gas presently used. Technology to control these emissions is available but has not yet been proven sufficient to be widely applied. The sulfur content of eastern coal varies considerably, but approximately 65 percent of the developed resources have a sulfur content exceeding 1 percent. Most of the U.S. low-sulfur coal is located in the western states. Any large-scale shift to coal would require relaxation of emission regulations or improvement of technologies to convert coal to gaseous or liquid fuels.

Surface Mining: The primary effect of surface mining is disruption of the land. This affects all local flora and fauna and water quality, and it increases landscape problems due to erosion and mine runoff. Reclamation is difficult in the western states due to the lack of water to assist in revegetation. Other problems include acid-mine-water drainage, leachings from spoil piles, processing waste, and disturbances caused by access and transportation. Noise and vibration resulting from operations also can be expected. Finally, surface mining causes conflicts with other resource uses such as agriculture, recreation, water, and wildlife habitat.

The land use of strip-mining ranges from 0.8 to 5.9 acres/10^{12} BTU extracted, depending on seam thickness and BTU content of the coal.

Underground Mining: Underground mining primarily affects land and water quality. The land effects are those that arise from subsidence, waste disposal, access, and transportation. Very little surface is disturbed. Subsidence can destroy structures, cause landslides and earthquakes, and disrupt groundwater-circulation patterns. The amount of subsidence can be controlled by the mining method used and the amount of coal removed. The utilization of certain mining methods and the restriction of the amount of coal extracts can have detrimental effects on the economics of the operation.

Water quality is affected by both processing waste and the drainage of acid-mine-water into surrounding areas. These can be minimized through the proper methods of control both during and after operations. Waste piles can be replaced in the mine and entrances sealed. This also would help to minimize subsidence. Other pollution problems are those associated with road and coal dust and the like, but these are minimal and easily controlled. Other disturbing aspects of mining have much less of an effect in an underground mine. Working conditions of underground mines have been improved under the Federal Coal Mining Health and Safety Act of 1969, although further efforts are needed to reduce health hazards. This program has resulted in increasing costs of underground mining when compared to surface mining, which has even more severe environmental consequences.

Coal Transportation: The five major transportation systems (road, rail, water, conveyor, and pipeline) all have some adverse environmental effects. These include air and noise pollution, safety hazards, land-use conflicts, trash-disposal problems, and aesthetic damage. However, since spill problems are not associated with coal, most of the effects can be controlled with greater care and consideration. A slurry pipeline also requires large supplies of water and must adequately dispose of this at the other end. Water availability is a problem in many areas of the U.S., especially in the west where energy resource requirements will have to compete with existing commercial and private users for a limited and fragile resource.

Coal Conversion: Technology for conversion of coal into gaseous and liquid hydrocarbons has been established for several decades, and a number of relatively low-capacity commercial plants exist in various parts of the world. However, few cost-effective advanced technologies have progressed beyond the pilot-plant stage.

Numerous problems remain before commercial development of synthetic fuels from coal can proceed. Specific technical problems must be solved. The cost effectiveness of synthetic fuels from coal will depend on prices of other fuels, primarily oil and natural gas.

The Energy Security Act of 1980 created the United States Synthetic Fuel Corporation. The corporation is empowered to provide financial assistance to the private sector for commercial synthetic fuel projects. The goal of the corporation is to increase synthetic fuel production to the equivalent of at least 500,000 barrels of oil per day by 1987 and 2,000,000 barrels per day by 1992.

Control of adverse environmental effects will increase the cost of producing synthetic fuels. Possible constraints on development include: technological constraints, availability of skilled workers, available raw materials (coal, water, steel), capital, institutional constraints, government policies (energy-resource leasing, coal-mining regulations, permit procedures, etc.) and the willingness of industry to invest in development of new technologies.

Synthetic oil and gas could contribute substantially to energy supplies by the year 2000. The most important contributions would be high-BTU gas from coal, synthetic crude oil from oil shales, and coal liquefaction. The success of these energy sources will depend on developing technology, the cost of the effects, and the cost of conventional oil and gas.

Coal Gasification: Gaseous fuels with low, intermediate, or high energy content can be produced. Low and intermediate gases are produced in a two-stage process involving preparation and gasification, and the output is utilized as feedstock for electric generators. A third process, "upgrading," is required to produce high-BTU gas, which produces an end product usable by the consumer.

Among low-BTU gasification processes under development are: Lurgi, Koppers-Totzek (both in commercial use), Bureau of Mines Stirred Fixed Bed, and Westinghouse Fluidized Bed. Among high-BTU gasification processes are: Lurgi High-BTU gasification process, HYGAS, BI-Gas, Synthane, and CO_2 Acceptor.

The environmental effects of coal gasification are those of mining plus those resulting from the production process. Gasification processes have lower primary efficiency than direct coal combustion; more coal will have to be gasified to reach an equivalent BTU output. However, it is likely that coal gasification will achieve primary efficiencies of 70 percent, which is about twice that of coal to electricity end use. Water effects of processing can be minimized by recycling and evaporation. However, large inputs of water are required for some of the technologies, thus creating the potential for conflicts in water-short areas. For example, a Koppers-Totzek gasifier producing 250×10^9 BTU per day will require water in the amount of 463,000 gallons per day and coal in the amount of 10,570 tons per day.

Air pollution could include sulfur dioxide, particulates, nitrous oxides, hydrocarbons, and carbon monoxides.

Land effects result from solid-waste disposal plus land use for the plant, coal storage, and cooling sands, etc. Solid wastes include ash, sulfur, and minute quantities of some radioactive isotopes.

Coal Liquefaction: Liquified coal is expected to replace conventional crude oil as the major source of liquid fuel and provide 10 percent of total domestic energy consumption by 2020 (Table I-5).

As with coal gasification, production of liquid fuels from coal requires either addition of hydrogen or removal of carbon from the compounds in the coal. Coal liquefaction can be accomplished by hydrogenation, pyrolysis, or catalytic conversion. Only catalytic conversion is in commercial operation. Among liquefaction processes under development are: synthoil, H-Coal, Solvent Refined Coal, Consol Synthetic Fuel, COED, TOSCOAL, and Fischer-Tropsch.

Again, the effects of liquefaction will be those of mining and those of the processing plants. The available technologies have a recovery rate of from 0.5 to 3 barrels of oil per ton of coal processed.

Water effluents from liquefaction plants could contain amounts of phenols, solids, oil, ammonia, phosphates, etc. The waste water could be treated to remove most of these products.

Air pollution could result from particulates, nitrogen, sulfur oxides, and other gases. Pollution-control facilities would be required but would lower the economic attractiveness of the plants.

Solid wastes would be mostly ash. If liquefaction plants were sited near mine openings, residue could be buried in the mines with little further environmental effects.

Nuclear Power - Fission: The predominant nuclear system used in the United States is the uranium-dioxide-fueled, light-water-moderated and cooled nuclear power plant. Research and development is being directed toward other types of reactors, notably the breeder reactor.

Between 1970 and 1980, nuclear-energy production increased from 21.8 billion kilowatt hours (1.4% of total U.S. electricity production and 0.4% of total energy production) to 251.1 billion kilowatt hours (11.0% of total U.S. electricity production and 4.2% of total energy production). Installed generating capacity increased from 6.5 million kilowatts (1.9% of U.S. total) to 56.5 million kilowatts (9.2% of U.S. total).

Due to environmental concerns, the growth of nuclear energy may be slowing. At the end of 1980 there were 75 reactors in the U.S., up from 19 in 1970. Although four reactors were licensed in 1980, fourteen other planned units were cancelled, and the Nuclear Regulatory Commission closed five for modification to comply with revised seismic requirements, and shut down eight reactors comparable to Three Mile Island's to determine the probability of a similar accident and to make required safety modifications. Nuclear-energy output was down 1.6 percent in 1980. There are currently 102 reactors under various stages of construction, construction-permit review, or on order.

Nuclear-power development has encountered delays in licensing, siting, and environmental constraints as well as manufacturing and technical problems. Future capacity will be influenced by the availability of plant sites, plant-licensing considerations, environmental factors, nuclear-fuel costs, rate of development of the breeder and fusion reactors, and capital costs.

Domestic uranium resources are probably plentiful. Ultimately recoverable reserves are estimated to be 6,876 million short tons, and large areas are unexplored. Twenty-one million short tons were consumed in 1980 domestic nuclear-energy production.

Although fuel-cycle costs of nuclear reactors have increased only slightly in recent years, present trends in reactor capital costs are significantly narrowing the economic advantage offered by fuel-cycle costs over coal- and oil-fired plants. Nuclear energy may provide up to 19 quads in 2020, 13 percent of total domestic consumption (Table I-5).

Environmental Effect: Although nuclear plants do not emit particulates or gaseous pollutants from combustion, the potential for serious environmental problems exists. Some airborne and liquid radioactive materials are released to the environment during normal operation. The amounts released are very small, and potential exposure has been shown to be less than the average level of natural radiation exposure. The plants are designed and operated in such a way that the probability of harmful radioactivity released from accidents is very low.

Nuclear plants use essentially the same cooling process as fossil-fuel plants and thus share the problem of heat dissipation from cooling water. However, light-water reactors require larger amounts of cooling water and discharge greater amounts of waste heat to the water than comparably sized fossil-fuel plants. The effects of thermal discharges may be beneficial in some, though not all, cases. Adverse effects can often be mitigated by use of cooling ponds or cooling towers.

Low-level radioactive wastes from normal operation of a nuclear plant must be collected, placed in protective containers, and shipped to a federally-licensed storage site for burial. High-level wastes created within the fuel elements remain there until the fuel elements are processed. Currently, spent fuel is stored at NRC-licensed facilities. Plans call for recovering unused fuels at reprocessing plants, solidifying the wastes, and placing them in storage at a federal repository.

Primary residuals from light-water reactors are waste-heat and radioactive emissions. For a 1,000 MW(e)-plant operating at a 75-percent load factor, a 33-percent-efficient nuclear plant would emit 47×10^{12} BTU's of waste heat annually. For comparison, a 40-percent-efficient fossil-fuel plant would emit 36×10^{12} BTU's of waste heat.

There are also effects on land, water, and air quality arising from the mining of these uranium ores. Dwindling amounts of high-grade reserves will increase the amount of land mined for lower-grade radioactive ores--primarily in western states. The mining operations will be similar to coal, but the nature and distribution of the deposits mean "lesser" effects while radioactive tailings cause unusual problems for disposal, the environment, and human health.

A more complete discussion of uranium mining and processing, the economics and environmental impacts, as well as nuclear fission and fusion can be found in Chapters 6 and 7 of Energy Alternatives: A Comparative Analysis.

Nuculear Power - Fusion: The controlled fusing of atoms in a reactor is a long- term alternative-energy source. Scientific feasibility has yet to be proven but looks promising. Technological and commercial feasibility will have to follow, however. The main obstacles are obtaining a high enough temperature, and containing the reaction. It is unlikely that fusion will be available to any significant degree before 2025.

Fusion is attractive for two reasons: abundant fuel sources and relative safety. The reaction is fueled by deuterium and tritium. Deuterium exists naturally in sea water and would be nearly cost-free. Tritium can be inexpensively produced in a reactor from lithium, which is plentiful.

Because of the small neutron activation involved in fusion reactions, there would be lower radioactive inventories, fewer radioactive wastes, and less serious fuel-handling problems and accident risks.

A proposed hybrid fusion-fission fuel cycle would fuel fission reactors with fusion-produced isotopes and multiply the energy release of fusion tenfold, while demanding less of the fusion core, thus enhancing the safety characteristics of both reactors.

A proposed pure deuterium process, while possessing a lower reaction rate, would have a neutronless fuel cycle. Thus all particles and products would be electrically charged and there would, in theory, be no radioactivity.

Environmental Effect: The environmental risks from fusion energy are probably less than fission, but the degree of reduction, and the social acceptability of that degree, cannot be determined presently.

Oil Shale: Oil shale is a fine-grained, sedimentary rock which, when heated, releases a heavy oil that can be upgraded to synthetic crude oil. The technology for exploitation currently exists. The resource base for shale is very large, perhaps as much as 360 billion barrels.

Large areas of the United States are known to contain oil-shale deposits, but those in the Green River Formation in Colorado, Wyoming, and Utah have the greatest commercial potential.

Classes I and II deposits are at least 30 feet thick, average 30 gallons of oil per ton of shale, and include only the most accessible and better-defined deposits. Class III deposits are as rich as Classes I and II, but more poorly defined and less favorably located. Class IV deposits are lower-grade, poorly defined deposits ranging down to 15 gallons of oil per ton of shale.

Environmental Effect: Oil-shale development poses serious environmental problems. With surface or conventional underground mining, it is very difficult to dispose of the huge quantities of spent shale, which occupy a larger volume than before the oil was extracted. Inducing revegetation growth in an area of oil shale development is difficult and may take more than 10 years. In-place processing avoids many of these environmental hazards. With underground mining, the spent-shale problem is much less severe.

Air pollutants from the mining will come from dust and vehicular traffic. These will be predominantly particulates, followed by NO_x and CO, with minimal amounts of hydrocarbons, SO_x and aldehydes.

The mining of oil shale requires little water, both for operations and for reclaiming solid wastes. Water pollutants are considered negligible but may arise if saline water was encountered during the operations and had to be disposed of.

However, the processing (retorting) operations of oil shale consume large quantities of water and generate large amounts of waste water. The waste water must be treated and can be reused in the process. Therefore, it has been assumed that water pollution will not be a problem outside the complex. However, the limited availability of input water in the development area could lead to resource-use conflicts.

Air pollutants vary with the technology used. Solid waste comprises the greatest problem of oil-shale processing. The volume of the waste is greater than the volume of the input. Therefore, backfilling and the like would not provide a sufficient disposal space. Finally, there are the effects of access and of transporting the products. These are analogous to those of coal mining in the case of access, and petroleum distribution in the case of transporting the product.

A fuller description of this energy source can be found in Chapter 2 of Energy Alternatives: A Comparative Analysis.

Tar Sands: Tar sands are deposits of porous rock or sediments that contain hydrocarbon oils (tar) too viscous to be extracted by conventional petroleum recovery methods. Large-scale production efforts have been developed in Canada, but U.S. ventures have been minor. U.S. resources are concentrated in Utah, with some potentially commercial quantities in California, Kentucky, New Mexico, and Texas.

About 1.5 tons of rich tar sands yield about one barrel of tar, or bitumen, the equivalent of about 6.3×10^6 BTU's. Tar can be recovered either from sands mined on the surface or underground, or by direct underground extraction of the oil without mining. Recovery is followed by processing, upgrading to synthetic crude, and refining.

Ultimately recoverable reserves may be 100 billion barrels, including other heavy oils.

Environmental Effect: Surface mining produces substantial residuals, including modification of surface topography, disposal of large amounts of overburden, dust and vehicle emmissions, and water pollution. Reclamation can minimize these effects. Residuals are similar to those of coal.

The effects of processing tar sands are similar to those of oil shale. These include solid tailings from extraction, cooling water and blowdown streams, thermal discharges, and off-gases. Under controlled conditions, these residuals can be minimized.

Underground extraction without mining can result in thermal additions, contamination of aquifers, surface spills, surface-earth movements, noise pollution, and emission of gases.

Hydroelectric Power: Hydropower is energy from falling water, which is used to drive turbines and thus produce electricity. Conventional hydroelectric developments convert the energy of natural regulated stream flows falling from a height to produce electric power. Pumped storage projects generate electric power by releasing water from an upper to a lower storage pool and then pumping the water back to the upper pool for repeated use. A pumped storage project consumes more energy than it generates but converts offpeak, low-value energy to high-value peak energy. A more detailed discussion of this energy source is found in Chapter 9 of the Energy Alternatives: A Comparative Analysis.

Many of the major hydroelectric sites operating today were developed in the early 1950's. Thirty to forty years ago, hydroelectric plants supplied as much as 30 percent of the electricity produced in the U.S. Although hydroplant production has steadily increased, thermal-electric-plant production has increased at a faster rate.

From 1970 to 1980, hydroelectric-power production has fluctuated slightly between 220 and 300 billion kilowatt hours, about 4 percent of total U.S. energy production. As a proportion of total U.S. electricity production and installed generating capacity, hydroelectricity has dropped from 16 to 12 percent, although the latter has increased from 55.1 to 76.4 million kilowatts. Much of the recent hydroelectric development has been pumped-storage capacity.

It is likely that hydroelectric power will continue to represent a declining percentage of the total U.S. energy mix due to the following: high capital costs, seasonal variations in waterflows, land-use conflicts, environmental effects, competitive water use, and flood-control constraints. Sites with the greatest production capacity and lowest development costs have already been exploited.

Environmental Effect: Construction of a hydroelectric dam represents an irreversible commitment of the land resource beneath the dam and lake. Flooding eliminates wildlife habitat and prevents other uses such as agriculture, mining, and free-flowing river recreation.

Hydroelectric projects do not consume fuel and do not cause air pollution. However, use of streams for power may displace recreational and other uses. Water released from reservoirs during summer months may change ambient water temperatures and lower the oxygen content of the river downstream, adversely affecting indigenous fish. Fluctuating reservoir releases during peak-load operation also may adversely affect fisheries and downstream recreation.

Screens placed over turbines prevent the entrance of fish, but small organisms may pass through and may be killed.

Fish may die from nitrogen supersaturation, which results at a dam when excess water escapes from the draining reservoir. High nitrogen levels in the Columbia and Snake Rivers pose a threat to the salmon and steelhead resources of these rivers. Other adverse effects to water quality include possible saline-water intrusion into waterways and decreased ability of the waters to accommodate modate waste discharges.

Air quality will be affected only by dust and emissions during the construction phase. Afterwards, if the impoundment is used for recreation, motor exhaust would occur.

Solar Energy: Applications of solar energy must take into account the following:

-- Solar energy is a diffuse, low-intensity source requiring large collection areas. Only a small portion of the potential energy is utilized.

-- Its intensity is continuously variable with time of day, weather, and season.

-- Its availability differs widely between geographic areas.

Potential applications of solar energy show a wide range. Among them are:

-- Thermal energy for buildings-
  - Water heating, space heating, space cooling, combined systems
-- Renewable clean fuel sources -
  - Combustion of organic matter
  - Bioconversion of organic materials to methane
  - Pyrolysis of organic materials to gas, liquid, and solid fuels
  - Chemical reduction of organic materials to oil

-- Electric power generation -
  - Thermal conversion
  - Photovoltaic - residential/commercial, ground central station, space central station
  - Wind-energy conversion
  - Ocean-thermal difference

Solar-energy-collection systems are now commercially available nationwide. Sales of collectors have risen from 1.2 million square feet in 1974 to 14.3 million square feet in 1979.

Environmental Effect: Although fuel costs for backup systems and maintenance costs for solar units are small when compared with operating costs of conventional heating and cooling systems, the high initial or "fixed" costs of solar units make them unattractive to many homeowners and builders. However, the rising cost of gas and oil needed by conventional heaters means that, over time, the greater fixed costs of solar systems will be balanced by their lack of fuel costs.

Large-scale generation of electricity using solar energy is another promising application which is receiving increased funding. A number of technical and engineering problems now prevent commercialization of solar-steam-electric plants, though pilot projects are well underway.

Additional detail on this resource alternative is found in Chapter 11 of Energy Alternatives: A Comparative Analysis (U.S. Government Federal Policy Task Force Review Group, Solar Energy Analysis, 1978; Solar Energy Progress and Problems, 1978, EPA, USDOE, and Lawrence Berkeley Laboratories et al.).

Among the disadvantages of solar energy are high capital costs, expensive maintenance of solar collectors, thermal-waste disposal, and distortion of local thermal balances.

The effects so far identified with solar energy are relatively minimal. The primary effects of the use of this energy source on a wide scale will be land use. Due to the low density of the energy, large areas will be necessary for the collectors. However, the land use compares favorably with other forms of energy use, such as coal extraction.

To date, the only other known area of concern is thermal pollution. Direct use in space heating has no thermal effects. However, for solar-electric-power generation, heat will have to be collected and transferred to the generator.

Some localized thermal pollution may occur as a result, but the problem is not expected to be significant. Finally, solar plants can operate only intermittently. Thus, the energy will either have to be stored, or backup fossil-fuel plants will have to be built. These will have their own sets of environmental constraints.

Oil Imports: Spurred by new discoveries and competition, Middle East-oil production expanded in the 1950's and 1960's. New markets were opened and prices softened. The real price of oil fell from 1948 to 1972.

Simultaneously, U.S. consumption of oil increased while production stayed constant; imports were relied upon to make up the difference.

In 1973, the Arab-Israeli war was accompanied by an embargo imposed by OPEC against nations supporting Israel. The vulnerability of the importers to their own heavy demand became evident, and a huge price increase followed. This marked the end of the so-called era of "cheap energy," and efforts were made to curtail imports. Another large price increase occurred in 1979.

Three avenues were pursued for reducing imports: conservation, or reduced net-energy demand per unit of output; alternative energy; and increased domestic production. These are discussed elsewhere in this Appendix.

The results of these efforts for reducing imports seem to have been mostly successful. The underlying market structure for energy has been altered. World demand for oil peaked in 1977 and appears to be in an irreversible structural decline. Gross national products have been rising along with nonenergy output, alternative-energy sources, and non-OPEC production. Oil is wholly responsible for declines in energy use.

OPEC produced 32 million barrels per day (mbd) in 1977 and now produces 24 million barrels daily. Current projections of energy consumption until the year 2000 show rates of half of what was projected in 1972. The Department of Energy is currently projecting a .9-percent annual growth rate (actual growth was 1.9% annually from 1970-1979), and a 3-percent annual economic growth. The dimensions of the structural change for the U.S. in 1981 are as follows:

-- Total energy consumption is down 5 percent.

-- Petroleum consumption is down (8 percent) for the third straight year.

-- Oil consumption as a percentage of total energy consumption is down 9 percent.

-- Imports of petroleum are down for the fourth straight year. Imports in May 1981 were 5.2 mbd, the lowest in 10 years. This is 20 percent less than in 1980 and 38 percent less than in 1979.

-- Imported petroleum as a percentage of total petroleum consumption is down 5 percent.

-- Imported petroleum as a percentage of total energy consumption is down 27 percent.

-- dollar of gross national product (GNP) has been steadily declining since 1970.

The OPEC probably will control the bulk of the world's oil production for the remainder of the century, due mainly to the short-term inelasticity of the supply of substitutes, and set prices based on factors besides price/cost relationships. Thus, the less dependent the U.S. is on OPEC, the less vulnerable the U.S. is to large, erratic price increases. Imports from the Middle East also bring problems of stability of supply, balance of payments, currencyexchange rates, and U.S. offloading capacity.

The U.S. will probably remain somewhat dependent on imported energy throughout this century and, as the 1970's showed, there are situations in the Middle East which could lead to major disruptions in supply or huge price increases. However, the propensity for such anomalies is less than in the past, due primarily to the following:

-- As mentioned above, the underlying market structure for energy has been altered and demand for oil has declined drastically. Associated with this, OPEC will have considerable spare capacity, and price cohesiveness will be difficult to maintain.

-- All OPEC nations need to produce oil to finance development. The goal of many OPEC nations is to maximize oil's long-term contribution to the national economy, rather than to maximize short-term profits. If revenue falls below a certain level where OPEC nations are not realizing an acceptable income, domestic tensions may ensue.

-- The OPEC economies, especially Saudi Arabia's, are more interdependent with the West than previously. The OPEC has invested interest and financial reserves in the West, imports a large amount of goods from the West, and has its oil prices tied to Western currency-exchange rates.

-- The presence of strategic stockpiles provides both a deterrent to intentional disruptions in world markets and a cushion for smoothing price and supply shocks. Current stockpile inventories of most Western nations are at record levels.

The OPEC's output and pricing structure also will depend on its balancing of:

-- Future vs. present proceeds.

-- Benefits vs. costs of rapid modernization.

-- Discipline in the market vs. the political unity of OPEC.

Environmental Effect: The primary hazard to the natural environment of increased oil imports is the possibility of oil spills, which can result from accidental discharge, intentional discharge, and tanker casualties. Intentional discharges would result largely from uncontrolled unballasting of tankers. The effects of chronic, low-level pollution are largely unknown. The worldwide tanker casualty analysis indicates that, overall, an insignificant amount of the total volume of transported oil is spilled due to tanker accidents. However, a single incident such as the breakup of the Torrey Canyon in 1967 or the Amoco Cadiz in 1978 can have disastrous results. Of more concern than tanker spills is the effect on the social and economic environment. The potential for a future embargo under this option is such that American productivity and policy could become subservient to foreign influence, having both economic and security implications for the nation. On a more subtle level, political alignments and policies of the U.S. could become tied to those of foreign oil powers. This option is the least acceptable for continued American energy independence.

Natural-Gas Imports: Imports of natural gas via pipeline have come largely from Canada; with small amounts also coming from Mexico. In 1980, net pipeline imports from Canada were 881 billion cubic feet, about 4.4 percent of the total natural gas used in the United States. These imports were about 33 percent of Canada's natural-gas production.

The natural-gas import situation continues to be highly uncertain. A major reason for this uncertainty is the disparity between prices for natural gas and alternative fuels in this country and the price of crude oil in world markets.

The United States and Canada concluded an agreement in March 1980 that established a formula for escalating the price of Canadian imports. The formula prices Canadian gas at the BTU-equivalent price of Canadian crude oil imports, minus an adjustment that reflects savings to Canada of certain transportation costs. In response to escalated Canadian prices, demand in the U.S. for Canadian gas dropped sharply. Consequently, Canada has foregone the opportunity to raise its export price. What modifications, if any, the Canadians will make to their pricing formula, and what minimum amounts of Canadian gas Americans must take under existing contracts, are matters currently being examined on both sides of the border.

Mexico could be a significant source of future imports because of its relatively large natural-gas-resource base. Imports from Mexico were of a local nature until 1957 and have declined since 1969. In September 1979, an agreement was concluded between the U.S. and Mexico regarding the importation and pricing of natural gas. A base price was specified to be escalated in proportion to the average price of five crude oils traded on the world market. However, the rapid increase in world oil prices between the time the agreement was concluded and the time the price escalation began brought the price of Mexican gas substantially below both oil parity and the Canadian gas price. Consequently, Mexico requested and received the same price as the Canadians.

Natural gas imports are expected to be eliminated in the long run, as domestic natural gas production will nearly satisfy decreasing demand, and synthetic gas from coal can provide the balance and replace imports.

Environmental Effect: The environmental effects of increasing gas imports derive mainly from the possible increased use of land for pipeline construction. A further effect is the risk of explosions and fires. Fluctuations of supply could influence quality of life, productivity, and employment. American policies also could become influenced by decisions of foreign gas producers; much as they could under the option of increasing oil imports.

Liquefied-Natural-Gas Imports: The growing shortage of domestic natural gas has encouraged projects to import liquefied natural gas (LNG) under long-term contract. Large-scale shipping of LNG is a relatively new industry. Several LNG projects are now under consideration on the Pacific, Atlantic, and Gulf Coasts. The security of foreign LNG is questionable. The complexity of the length of time involved in implementing these proposals has been increased by the need for negotiating preliminary contracts, securing the approval of the Federal Energy Regulation Commission and the exporting country, and making adequate provision for environmental and safety concerns in the proposed U.S. facilities. The authority to construct and operate facilities to implement imports and exports must be obtained separately from the Federal Energy Regulatory Commission. The costs of liquefying and transporting natural gas, other than overland by pipe, are high.

The U.S imported 85 billion cubic feet of LNG from Algeria in 1978. In March 1980, Algeria announced that it was demanding oil-price parity, free-on-board, for gas it exported to the U.S., and it subsequently discontinued deliveries. The free-on-board price does not include transportation, terminal, and regasification costs, which are substantial. Negotiations with the Algerians are in progress.

Environmental Effect: The environmental effects of LNG imports arise from tankers; terminal, transfer, and regasification facilities; and transportation of gas. The primary hazard of handling LNG is the possibility of a fire or explosion during transportation, transfer, or storage.

Receiving and regasification facilities will require prime shoreline locations and channel dredging. Regasification of LNG will release few pollutants to the air or water.

LNG imports will influence the U.S. balance of payments. This effect will depend on the origin and purchase price of the LNG, the source of the capital, and the country (U.S. or foreign) in which equipment is purchased and LNG tankers are built.

Geothermal Energy: Geothermal energy is primarily heat energy from the interior of the earth. It may be generated by radioactive decay of elements such as uranium or thorium, and friction due to tidal or crustal plate motions.

There are four major types of geothermal systems: hot-water, vapor-dominated, geopressured reservoirs, and hot-dry-rock systems.

In addition to electricity, geothermal energy can offer a potential for space heating, industrial processing, and other nonelectric uses in many areas which presently are highly dependent upon oil and gas for energy needs. However, geothermal-electric generating plants are smaller than conventional plants and require a greater amount of steam to generate an equal amount of energy. This is due to the fact that temperatures and pressures associated with geothermal areas are lower than those created at conventional power plants.

The greatest potential for geothermal energy in the U.S. is found in the Rocky Mountain and Pacific regions; some potential exists in the Gulf Coastal Plain of Texas and Louisiana. The geyser field in California is the most extensively developed source of geothermal energy in the U.S. It has been producing power since 1969. Exploration efforts are also underway in the Imperial Valley, Salton Sea, Mono Lake, and Modoc County, California.

Between 1970 and 1980, geothermal production increased from 525 to 5,073 million kilowatt hours, and installed generating capacity increased from 84 to 1,005 kilowatts. Geothermal energy presently accounts for less than 1 percent of total U.S. energy production.

Environmental Effect: A number of gases are associated with geothermal systems and may pose health and pollution problems. These gases include ammonia, boric acid, carbon dioxide, carbon monoxide, hydrogen sulfide, and others. However, adverse air-quality effects are generally less than those associated with fossil-fuel plants. Also associated with geothermal-energy systems are saline waters, which must be disposed of and isolated from contact with groundwater regimes.

Land-quality problems stem from disturbance due to construction of related facilities and possible ground subsidence which, in turn, can cause structural failures and loss of groundwater storage capacity.

Other Energy Sources: The high cost and rapidly shrinking reserves of traditional energy fuels have encouraged research into new and different sources for potential energy. Some of these alternate sources have been known for decades, but high costs and technical problems have prevented their widespread use. They include tidal power, wind power, organic fuels, and ocean thermal-gradients, among others. These sources are expected to account for up to 13 percent of total domestic energy consumption by 2020 (Table I-5).

Environmental effects of these alternatives are difficult to assess, especially since a great amount of research and development remain to be completed before operational-scale systems can be developed, tested, and evaluated for production and application.

The date of commercial availability of such alternatives will depend on the cost of the traditional energy fuels, the level of federally subsidized research through Energy Research and Development Administration assistance, and the solution of engineering and technical problems.

Combination of Alternatives: A combination of some of the most viable energy sources available to this area, discussed above, could be utilized to attain an energy equivalent comparable to the estimated production within the anticipated field life of this proposed action. However, this combination of alternatives, in order to attain the needed energy mix peculiar to the infrastructure of this area, would have to consist of energy sources attainable now or within the suggested timeframe that are transferable to the technology presently used. Viable substitutes would have to be available for the petroleum and natural gas required by the petrochemical industrial complex; the petroleum used for the transportation sector; and the electricity and fuels used in residential and commercial sectors.

Part II of the Energy Alternatives: A Comparative Analysis, particularly Chapter 16, "Comparing the Economic Costs of Energy Alternatives," discusses the factors that must be involved in developing technically and economically appropriate energy alternatives.

Tables I-1, I-2, and I-3 display U.S. production, consumption, and net imports of energy by type, 1970-1980. The most noteworthy change in energy to occur in the 1970's was the enormous increase in the prices of fossil fuels (see Table I-4).

These price increase were caused mainly by the large increases in crude oil prices set by OPEC in 1974 (357%) and in 1980 (95%). The OPEC controls the bulk of the world's oil production and can set market prices based on factors other than price/cost relationships. Increases in the prices of substitutes, gas and coal, followed.

Thus, while the amounts produced, consumed, and imported did not change drastically (although crude oil consumption and imports did rise and fall), their value did increase substantially.

Table I-5 displays the Department of Energy's (1980 Annual Report to Congress) projections of domestic energy production and consumption, by type, form 1985 to 2020. The DOE prepared three series of projections, each a function of a distinct time path (low, medium, or high) for the price of international (imported) oil. Even the low-price time series assumes (slight) real price increases (prices rising faster than the general inflation rate); Table I-5 displays the low-price projections, given the considerations regarding OPEC's waning price-setting strength.

Allowing favorable technologies and economies, the most viable domestically available energy alternatives would probably consist of: the use of coal, oil shale, tar sands, and biomass to produce synthetic liquids; nuclear energy, and coal to compete for the utility market; and renewables to supply a sizable portion of total energy requirements. The environmental effects of each of these alternatives have been discussed briefly in the previous sections. The result will be a long-term energy-supply transition from crude oil and less dependence on oil imports. Such patterns will require new, efficient technologies, major capital investments, and a high rate of growth in coal production.

The future U.S. energy-source mix will depend on a multiplicity of factors: the identification of resources; research and development efforts; development of technology; rate of economic growth; the economic climate; changes in lifestyle and priorities; capital investment decisions; energy prices; world oil prices; environmental quality priorities; government policies; and availability of imports.

It is unlikely that there will ever be a single definitive choice among energy sources, or that development of one source will preclude development of others. Different energy sources will differ in their rate of development and the extent of their contribution to total U.S. energy supplies. Understanding of the extent to which they may replace or complement offshore oil and gas requires reference to the total national energy picture. Relevant factors are:

-- Historical relationships indicate that energy requirements will grow in proportion to the gross national product.

-- Energy requirements can be constrained to some degree through the price mechanisms in a free market or by more direct constraints. One important type of direct constraint operating to reduce energy requirements is through the substitution of capital investment in lieu of energy, e.g., insulation to save fuel. Other potentials for lower energy use have more far-reaching effects and may be long range in their implementation--they include rationing, altered transportation modes, and major changes in living conditions and lifestyles. Even severe constraints on energy use can be expected to only slow, not halt, the growth in energy requirements within the timeframe of this statement.

-- Energy sources are not completely interchangeable. For example, solid fuels cannot be used directly in internal combustion engines. Fuel-conversion potentials are severely limited in the short term, although somewhat greater flexibility exists in the longer run and generally involves choices in energy-consuming capital goods.

-- The principal competitive interface between fuels is in electric power plants. Moreover, the full range of flexibility in energy use is limited by environmental considerations.

-- Regulation of oil and gas prices lowered the price below the product level that refiners (and consumers) paid for domestic oil, and prevented the incremental cost of all domestic producing fields from equating to the price of imports. This impaired the economy's ability to adjust to world energy prices: underproduction of domestic oil, overconsumption of imports, and impediments to alternative energy. Under deregulation, the real prices of oil and gas will be closer to the marginal costs of alternative energy.

-- A broad spectrum of research and development is being directed toward energy conversion--more efficient nuclear reactors, coal gasification and liquefaction, liquefied natural gas (LNG), and shale retorting, among others.

Several of these could assume important roles in supplying future energy requirements, although their future competitive relationship is not yet predictable.

Table I-1

U.S. Production of Energy by Type
1970-1980

Year	Coal: Quads	Coal: Percent of Total Production	Coal: Percentage Change from Previous Year	Crude Oil[1/]: Quads	Crude Oil[1/]: Percent of Total Production	Crude Oil[1/]: Percentage Change from Previous Year	NGPL[2/]: Quads	NGPL[2/]: Percent of Total Production	NGPL[2/]: Percentage Change from Previous Year	Natural Gas (Dry): Quads	Natural Gas (Dry): Percent of Total Production	Natural Gas (Dry): Percentage Change from Previous Year
1970	15	24	---	20	32	---	3	5	---	22	35	---
1971	14	23	-7.1	20	32	0	3	5	0	22	35	0
1972	14	22	0	20	32	0	3	5	0	22	35	0
1973	14	23	0	19	31	-5.3	3	5	0	22	35	0
1974	14	23	0	19	31	0	2	3	-50	21	34	-4.8
1975	15	25	7.1	18	30	-5.6	2	3	0	20	33	-5.0
1976	16	27	6.7	17	28	-5.9	2	3	0	19	32	-5.3
1977	16	27	0	17	28	0	2	3	0	20	33	5.3
1978	15	25	-6.7	18	30	5.9	2	3	0	19	31	-5.3
1979	18	28	20.0	18	28	0	2	3	0	20	31	5.3
1980	19	29	5.6	18	28	0	2	3	0	20	31	0
Avg. Annual Growth			2.4%			1.1%			-4.1%			-1.0%

U.S. Production of Energy by Type
1970-1980
(cont.)

Year	Hydroelectric Power[3/]: Quads	Hydroelectric Power[3/]: Percent of Total Production	Hydroelectric Power[3/]: Percentage Change from Previous Year	Nuclear Electric Power: Quads	Nuclear Electric Power: Percent of Total Production	Nuclear Electric Power: Percentage Change from Previous Year	Other[4/]: Quads	Other[4/]: Percent of Total Production	Other[4/]: Percentage Change from Previous Year	Total Energy Produced: Quads	Total Energy Produced: Percentage Change from Previous Year
1970	3	5	---	0	0	---	0	0	---	63	---
1971	3	5	0	0	0	0	0	0	0	62	-1.6
1972	3	5	0	1	2	0	0	0	0	62	-1.6
1973	3	5	0	1	2	0	0	0	0	62	-1.6
1974	3	5	0	1	2	0	0	0	0	61	-1.6
1975	3	5	0	2	3	100	0	0	0	60	-1.7
1976	3	5	0	2	3	0	0	0	0	60	0
1977	2	3	0	3	5	50	0	0	0	60	0
1978	3	5	0	3	5	0	0	0	0	61	1.6
1979	3	5	0	3	5	0	0	0	0	64	4.9
1980	3	5	0	3	5	0	0	0	0	65	1.6
Avg. Annual Growth			0%			14.7%			0%		0.3%

Source: Energy Information Administration.

1/ Includes lease condensate.
2/ Natural gas plant liquids.
3/ Includes industrial and utility production of hydropower.
4/ Includes geothermal power and electricity produced from wood and waste.

Table I-2

U.S. Consumption of Energy by Type
1970-1980

Year	Coal: Quads	Coal: Percent of Total Consumption	Coal: Percentage Change from Previous Year	Natural Gas (Dry): Quads	Natural Gas (Dry): Percent of Total Consumption	Natural Gas (Dry): Percentage Change from Previous Year	Petroleum: Quads	Petroleum: Percent of Total Consumption	Petroleum: Percentage Change from Previous Year	Hydroelectric Power[1/]: Quads	Hydroelectric Power[1/]: Percent of Total Consumption	Hydroelectric Power[1/]: Percentage Change from Previous Year
1970	13	19	---	22	33	---	30	45	---	3	4	---
1971	12	18	-8.3	22	32	0	31	46	3.3	3	4	0
1972	12	17	0	23	32	4.5	33	46	6.5	3	4	0
1973	13	17	8.3	23	31	0	35	47	6.1	3	4	0
1974	13	18	0	22	30	-4.5	33	45	-6.1	3	4	0
1975	13	18	0	20	28	-10.0	33	46	0	3	4	0
1976	14	19	7.7	20	27	0	35	47	6.1	3	4	0
1977	14	18	0	20	26	0	37	49	5.7	3	4	0
1978	14	18	0	20	26	0	38	49	2.7	3	4	0
1979	15	19	7.1	21	27	5.0	37	47	-5.7	3	4	0
1980	16	21	6.7	20	26	-5.0	34	45	-8.8	3	4	0
Avg. Annual Growth			2.1%			-1.0%			1.3%			0%

U..S. Consumption of Energy by Type
1970-1980
(cont.)

Year	Nuclear Electric Power: Quads	Nuclear Electric Power: Percent of Total Consumption	Nuclear Electric Power: Percentage Change from Previous Year	Other[2/]: Quads	Other[2/]: Percent of Total Consumption	Other[2/]: Percentage Change from Previous Year	Total Energy Consumed: Quads	Total Energy Consumed: Percentage Change from Previous Year
1970	0	0	---	0	0	---	67	---
1971	0	0	0	0	0	0	68	1.5
1972	1	1	---	0	0	0	72	5.9
1973	1	1	0	0	0	0	75	4.2
1974	1	1	0	0	0	0	73	-2.7
1975	2	3	100	0	0	0	71	-2.8
1976	2	3	0	0	0	0	75	5.6
1977	3	4	50	0	0	0	76	1.3
1978	3	4	0	0	0	0	78	2.6
1979	3	4	0	0	0	0	79	1.3
1980	3	4	0	0	0	0	76	-3.9
Avg. Annual Growth			14.7%			0%		1.3%

Source: Energy Information Administration

1/ Includes industrial and utility production, and net imports of electricity.
2/ Includes geothermal power, electricity produced from wood and waste, and net imports of coal coke.

Table I-3
U.S. Net Imports of Energy by Type, 1970-1980

Year	Coal		Crude Oil and Refined Petroleum Products[1/]		Natural Gas (Dry)		Electricity		Coal Coke		Net Imports		Imports as Percentage of Total Energy Consumed	
	Quads	Percentage Change from Previous Year	Quads	Percentage Change from Previous Year	Quads	Percentage Change from Previous Year	Quads	Percentage Change from Previous Year	Quads	Percentage Change from Previous Year	Quads	Percentage Change from Previous Year	Percentage	Percentage Change from Previous Year
1970	-2	---	7	---	1	---	0	---	0	---	6	---	9.0	---
1971	-2	0	8	14.3	1	0	0	0	0	0	7	16.7	10.3	14.4
1972	-2	0	10	25.0	1	0	0	0	0	0	9	28.6	12.5	21.4
1973	-1	100	13	30.0	1	0	0	0	0	0	13	44.4	17.3	38.4
1974	-2	-100	12	-8.3	1	0	0	0	0	0	12	-8.3	16.4	-5.5
1975	-2	0	13	8.3	1	0	0	0	0	0	12	0	16.9	3.0
1976	-2	0	15	15.4	1	0	0	0	0	0	15	25.0	20.0	18.3
1977	-1	100	18	20.0	1	0	0	0	0	0	18	20.0	23.7	18.5
1978	-1	0	17	-5.9	1	0	0	0	0	0	17	-5.9	21.8	-8.7
1979	-2	-100	17	0	1	0	0	0	0	0	17	0	21.5	-1.4
1980	-2	0	13	-30.8	1	0	0	0	0	0	12	-41.7	15.8	-36.1
Avg. Annual Growth		0%	6.4%			0%		0%		0%		7.2%		5.8%

Source: Energy Information Administration.

1/ Includes crude oil, lease condensate, imports of crude oil for the Strategic Petroleum Reserve, refined petroleum products, unfininshed oils, natural gasoline, and plant condensate.

Table I-4

Prices of Domestically Produced Fossil Fuels
(Cents[1/] Per Million BTU's)

	1970	1980	Avg. Ann. Increase	1960-1970 Avg. Ann. Increase
Crude Oil	59.9	206.0	13.1%	-1.6%
Natural Gas	16.9	76.9	16.4%	-0.5%
Coal[2/]	27.9	64.9	8.8%	-1.5%

Source: Energy Information Administration.

1/ Constant 1972 dollars.
2/ Bituminous coal and lignite.

Table I-5
Projected U.S. Energy Production and Consumption, by Type
1985-2020
Low Oil Price Scenario

	1985		1990		1995		2000	
	Quads	Percentage of Total Consumption	Quads	Percentage of Total Consumption	Quads	Percentage of Total Consumption	Quads	Percentage of Total Consumption
Domestic Energy Supply								
Liquid Fuels								
Conventional Crude Oil 1/	17.8	22.3	16.7	18.7	16.5	16.7	16.1	15.1
Enhanced Recovery	1.2	1.5	2.0	2.2	2.9	2.9	3.3	3.1
Shale Oil and Tar Sands	.0	.0	0.1	0.1	0.5	0.5	1.0	0.9
Synthetic (from coal)	.0	.0	.0	.0	.0	.0	1.4	1.3
Liquids from Biomass	.0	.0	.0	.0	.0	.0	0.3	0.3
Total	19.0	23.8	18.8	21.1	19.9	20.2	22.1	20.7
Gaseous Fuels								
Conventional Natural Gas	17.1	21.4	16.1	16.1	15.9	16.1	11.3	10.6
Enhanced Recovery	.0	.0	.0	.0	.0	.0	5.6	5.3
Synthetic (from coal)	.0	.0	.0	.0	.0	.0	0.2	0.2
Total	17.1	21.4	16.1	18.0	15.9	16.1	17.1	16.0
Coal 2/	22.8	28.5	30.3	33.9	37.9	38.4	38.0	35.6
Nuclear	5.6	7.0	8.0	9.0	9.1	9.2	11.1	10.4
Other 3/	3.4	4.3	3.6	4.0	4.1	4.2	10.2	10.0
Total Domestic Production	67.9	85.0	76.8	86.0	86.9	88.0	98.6	92.6
Imports								
Net Oil Imports	12.7	15.9	14.1	15.8	14.1	14.3	10.6	9.9
Net Gas Imports	1.5	1.9	1.1	1.2	1.3	1.3	1.0	0.9
Net Coal Imports	-2.2	---	-2.7	---	-3.6	---	-3.7	---
Total Net Imports	12.0	15.0	12.5	14.0	11.8	12.0	7.9	7.4
Total Consumption	79.9	100.0	89.3	100.0	98.7	100.0	106.6	100.0

1/ Includes NGPL.
2/ Does not include coal used for synthetic oil and gas.
3/ Includes hydroelectric, geothermal, solar, wind, and biomass. Does not include liquids from biomass.

Source: Energy Information Administration.

Table I-5 (cont.)

Projected U.S. Energy Production and Consumption, by Type
1985-2020
Low Oil Price Scenario (continued)

	2010		2020		Avg. Ann. Growth 1985-2000 (Percentage)	Avg. Ann. Growth 2000-2020 (Percentage)
	Quads	Percentage of Total Consumption	Quads	Percentage of Total Consumption		
Domestic Energy Supply						
Liquid Fuels						
Conventional Crude Oil 1/	12.5	10.1	7.9	5.6	-0.7	-3.6
Enhanced Recovery	3.7	3.0	3.0	2.1	7.0	-0.5
Shale Oil and Tar Sands	2.2	1.8	3.1	2.2	16.6	5.8
Synthetic (from coal)	6.8	5.5	14.8	10.4	---	12.5
Liquids from Biomass	0.5	0.4	0.8	0.6	---	5.0
Total	25.7	20.9	29.6	20.8	1.0	1.5
Gaseous Fuels						
Conventional Natural Gas	8.7	7.1	6.3	4.4	-2.8	-3.0
Enhanced Recovery	7.0	5.7	7.6	5.3	---	1.5
Synthetic (from coal)	0.7	0.6	1.3	0.9	---	9.8
Total	16.4	13.3	15.2	10.7	.0	-0.6
Coal 2/	47.7	38.7	59.5	41.8	3.5	2.3
Nuclear	16.3	13.2	19.1	13.4	4.7	2.8
Other 3/	13.5	11.0	18.4	12.9	7.6	3.0
Total Domestic Production	119.6	97.1	141.7	99.6	2.5	1.8
Imports						
Net Oil Imports	6.9	5.6	4.3	3.0	-1.2	-4.6
Net Gas Imports	0.4	0.3	0.1	0.1	-2.7	-12.2
Net Coal Imports	-3.8	---	-3.9	---	-3.5	-0.3
Total Net Imports	3.5	2.9	0.5	0.4	-2.8	-14.8
Total Consumption	123.2	100.0	142.3	100.0	1.9	1.5

1/ Includes NGPL.
2/ Does not include coal used for synthetic oil and gas.
3/ Includes hydroelectric, geothermal, solar, wind, and biomass. Does not include liquids from biomass.

Source: Energy Information Administration.

APPENDIX J

Archeological Analysis for the Proposed
St. George/North Aleutian Basin Lease Offerings

Prepared by

Minerals Management Service

Appendix J
Archeological Analysis for the Proposed St. George/North Aleutian Basin Lease Offerings

This appendix includes "Archeological Analysis in the North Aleutian Basin" (Friedman, 1984/85), as well as a list of onshore historic and prehistoric sites in the lease sale area (Table J-1).

United States Department of the Interior

MINERALS MANAGEMENT SERVICE
RESTON, VA. 22091

Official
FILE COPY
Surname:

In Reply Refer To:
LMS-Mail Stop 644

JAN 11 1984

Memorandum

To: Regional Manager, Alaska Region

From: Deputy Associate Director for Offshore Leasing

Subject: Archeological Analysis for the St. George/North Aleutian Lease Offering

In accordance with our Interim Guidance on Outer Continental Shelf Cultural Resources (May 14, 1982), we are submitting an archeological analysis for the subject lease offering (attached). The report discusses the potential for and the survivability and detectability of prehistoric cultural resources in the offering area. The analysis concludes that, of the approximately 18,600 blocks in the offering area, none should require a cultural resource report from the lessee. There are 201 blocks which, if leased, will require additional study. The postlease analysis is necessary because these blocks are medium or high probability and there is insufficient data at this point to make a determination. This summary report was prepared by Ed Friedman, Archeologist, and Herb Schneider, Geophysicist.

Please review the analysis and use it with other information available to you in making your decisions concerning prehistoric cultural resource report requirements for the offering and later permitting actions. Please forward to us any comments you have regarding this analysis. If you have any questions or immediate concerns with this analysis, please contact Ed Friedman or Herb Schneider (FTS 928-6461).

Carolita Kallaur

Carolita Kallaur

Attachment

bcc: R. Smith/R. Tyagi/J. Gottlieb, Alaska Region
Official File (BEO)(EIS Lease Offering St. George/N. Aleutian) MS 644
Division File
Ahlfeld/Goll/Friedman/Schneider
AD/OMM
Offshore Chron
BEO Chron
LMS:BEO:EFriedman:dmb:01/04/84:860-6461 Disk Lear-Friedman

Archeological Analysis
Proposed Lease Offering
St. George/North Aleutian
(December 1984/April 1985)

prepared by
Edward Friedman and Herbert Schneider
Minerals Management Service
Reston, Virginia

Purpose

In accordance with the Minerals Management Service (MMS) Interim Guidance for Outer Continental Shelf Cultural Resources (May 14, 1982), this archeological analysis was prepared for the offshore lease offering for the St. George/North Aleutian areas. The analysis is intended to aid the Alaska Region in preparing environmental impact statement (EIS) discussions and the Offshore Leasing Management Division in making recommendations to the Secretary on cultural resource lease stipulations.

Project Area Description

The two adjacent planning areas that make up the proposed lease offering (Figure 1a and 1b) are the St. George Basin which lies in the eastern Bering Sea northwest of the Aleutian Islands chain and is bounded on the north by 59° N. latitude and on the south by the 3-geographical-mile line along the northern side of the Aleutian Islands. The area is bounded on the west by 174° W. longitude from 59° N. latitude to 56° N. latitude and by 171° W. longitude from 56° N. latitude to approximately 53°35' N. latitude. It is bounded on the east by 165° W. longitude from 59° N. latitude to the 3-geographical-mile line at approximately 54°14' W. latitude.

The North Aleutian Basin lies in the eastern Bering Sea northwest of the Alaska Peninsula and is bounded on the north by 59° N. latitude and on the north, south, and east by the 3-geographical-mile line. It is bounded on the west by 165° W. longitude from 59° N. latitude to the 3-geographical-mile line at approximately 54°40' N. latitude.

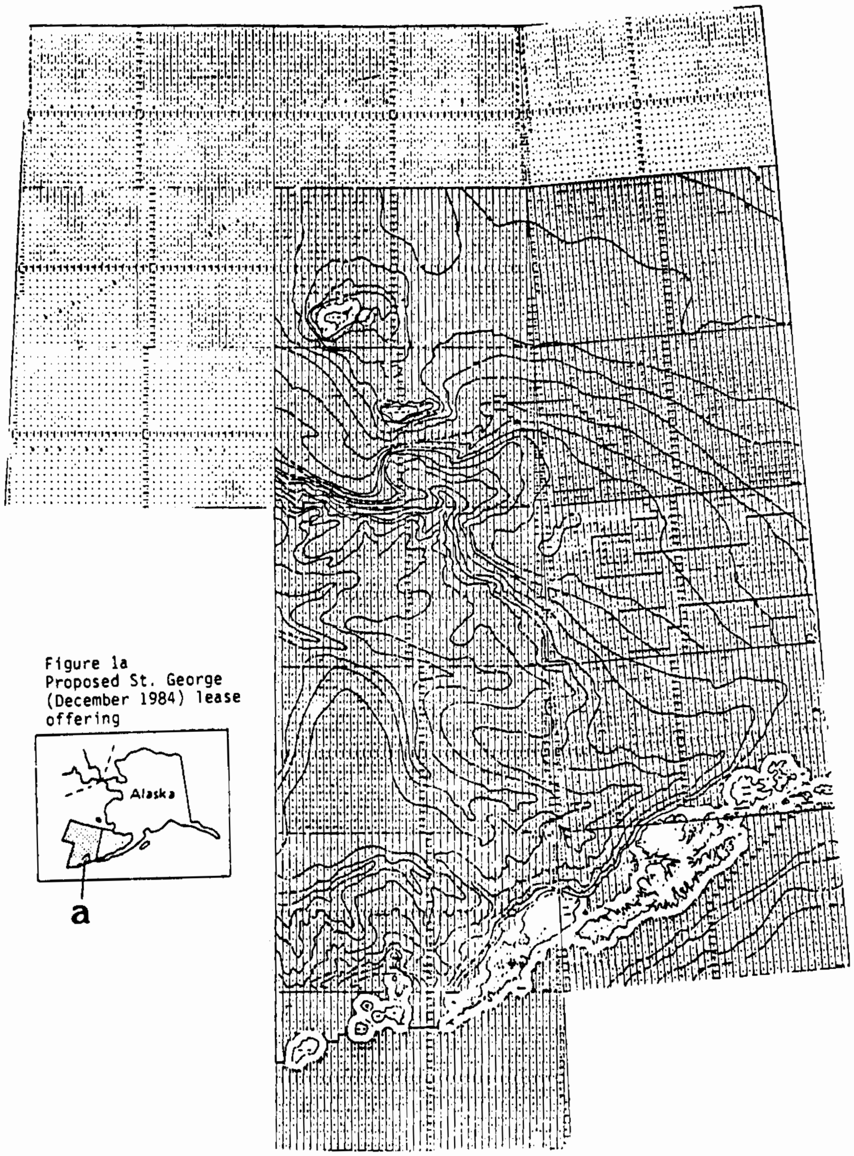


Figure 1a
Proposed St. George
(December 1984) lease
offering

a

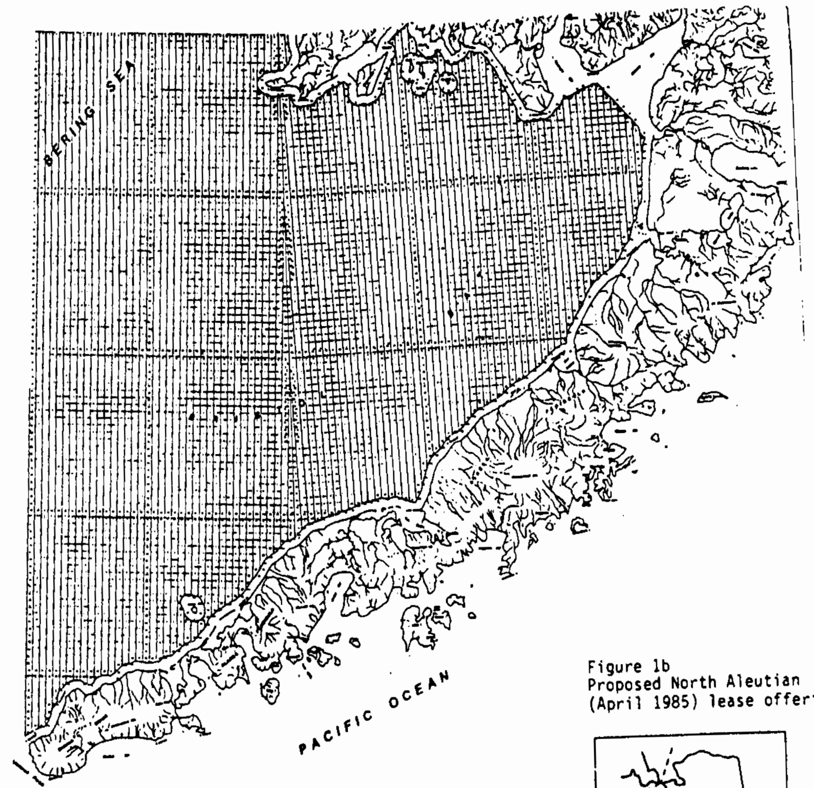


Figure 1b
Proposed North Aleutian
(April 1985) lease offering

b

The offering area contains approximately 18,600 blocks. About 95 have been leased in Lease Sale No. 70. Thus, 18,500 blocks were considered in this archeological analysis for the lease offering in the St. George/North Aleutian areas.

There are four proposed deferral areas: Inner Bristol Bay (1602 blocks), Alaska Peninsula (706 blocks), Unimak Pass (642 blocks), and Pribilof Islands (1699 blocks) (Figure 2a and 2b).

Method

The method used to develop the archeological analysis was established in the Interim Guidance.

The procedures outlined in the Interim Guidance are:

1. Examine the appropriate regional baseline study to determine if the blocks within the offering area have a high, medium, or low probability for prehistoric sites--those blocks falling in the low category will receive no further archeological consideration. If all the blocks are low probability, the cultural resource stipulation, if any, should not include a requirement for a report to identify prehistoric sites.

2. Examine the regional sea level curves when blocks of medium or high probability occur in the lease offering area. Blocks which lie in medium or high probability areas but were not above sea level during times of potential human habitation should be excluded from further consideration to incorporate a prehistoric site report requirement.

3. Examine the geological/geophysical literature for information regarding forces or processes that might have destroyed potential prehistoric sites or rendered them unrecoverable. Examples of such forces and processes are: glacial scouring, ice gouging, erosion, and excessive sedimentation.

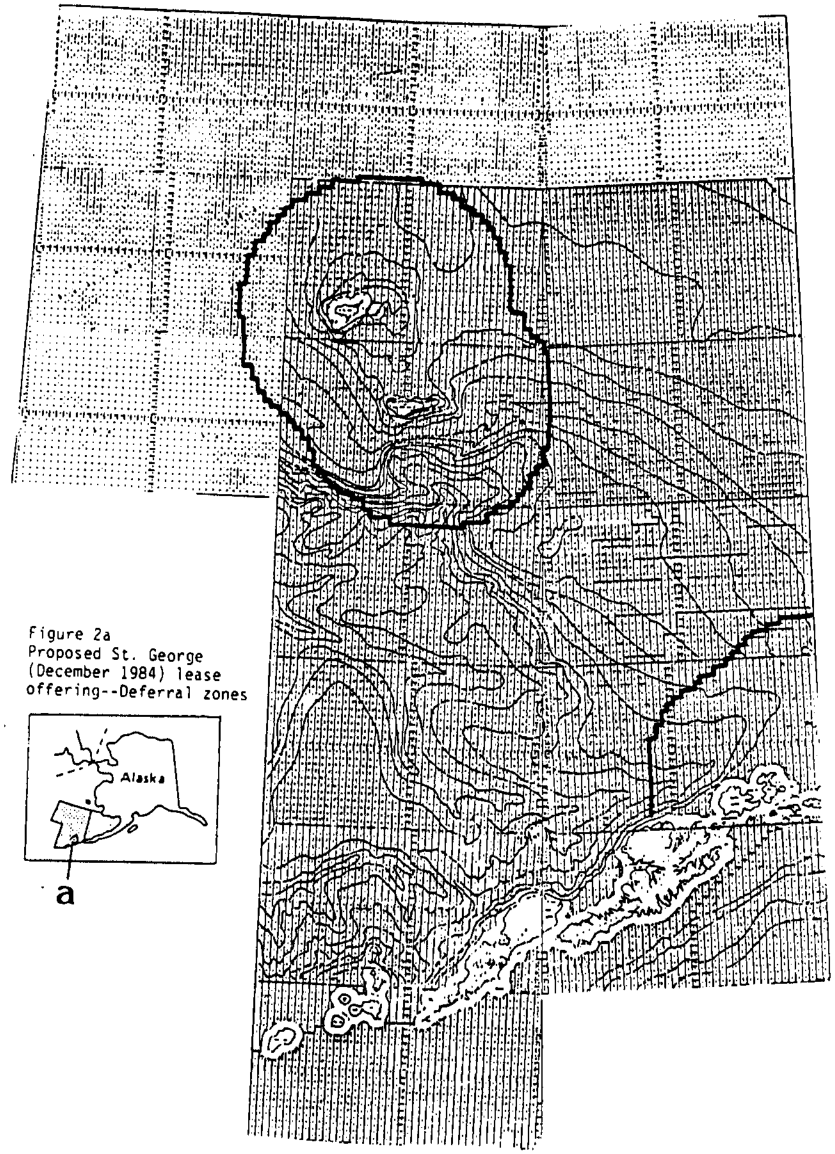


Figure 2a
Proposed St. George (December 1984) lease offering--Deferral zones

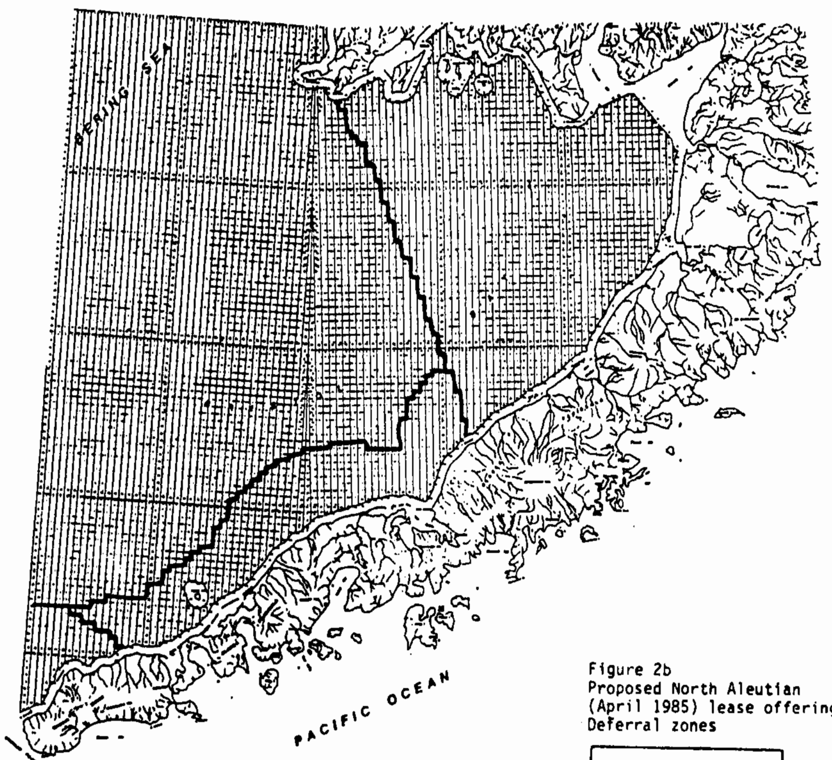
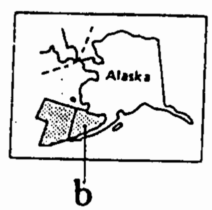


Figure 2b
Proposed North Aleutian
(April 1985) lease offering--
Deferral zones



Each block exhibiting exposure to such processes should be excluded from prehistoric site report consideration.

4. Examine the geology (resource) report, appropriate hazards survey, etc., for indications of significant landforms which were identified in the baseline study as being potentially habitable. Those blocks that do not contain significant landforms should be excluded from further consideration of a prehistoric report requirement under a lease stipulation. Specific landforms on blocks that have not been excluded in steps 1 through 3 above and have a medium or high probability for prehistoric sites should be examined in detail. Those blocks that are not excluded from further consideration should require a report under a lease stipulation.

In instances in which an archeological analysis has been conducted up to step 4 and it has been determined that no data exist relating to landforms, those blocks that are subsequently leased must have their postlease geohazards survey data examined for prehistoric site potential by an MMS archeologist and geophysicist.

5. If steps 1 through 4 above do not exclude all of the blocks with prehistoric site potential that are offered for lease in an area, and if the lessee proposes to conduct activities on a landform on one of those blocks, a prehistoric site report is required pursuant to the controlling lease stipulation.

<u>Analysis</u>

<u>Step 1--Review of Baseline Study</u>

Using the above method, we reviewed the approximately 18,500 blocks included in the offering area. A cultural resource baseline study has been prepared that covers the entire offering area (Dixon et al., 1976). As was noted in our comments on the draft environmental impact statement for Lease Sale No. 70, which coincides to a large extent with this lease offering, (March 31, 1982), ". . . the highly generalized nature of the cultural resource probability zones makes the report difficult to use for evaluating specific lease tracts." A recent study (Dixon et al., n.d.) refined the zones from the 9800 square miles to 9 square miles. Based on the revision there are five clusters of medium or high probability blocks. St. George Island, St. Paul Island (Figure 3a), Unimak Island, Inner Bristol Bay, and Cape Pierce (Figure 3b).

As no explicit criteria for establishing probability zones is presented in Dixon et al. (1976 or n.d.), those used for the adjacent Western Gulf of Alaska were employed (Dixon et al., 1977).

<u>High Probability Areas</u>

1. Nonglacial river mouths and constricted marine approaches to these river mouths, river margins, and lake outlets. Estuaries and rivers, particularly those issuing from lakes, would have concentrated anadramous fish and their predators.

2. Natural terrestrial constrictions, such as passes, which funnel large mammal movements.

3. Prominent spits, points, rocky capes, headlands, and islands that may have provided habitat for Phocid and Otarid seals and for marine birds. Such habitat is only considered high probability if it occurs in conjunction with one or more additional habitat types or if there is natural constriction which would tend to concentrate these species.

4. Areas of habitat diversity and general high marine intertidal productivity, particularly those which might have prompted extensive macrophyte development. An example of this type of environment would be deep sinous embayments.

<u>Medium Probability Areas</u>

1. Lake margins. Although the presence of fish and waterfowl resources enhance these areas as settlement locales, they are less likely to be as

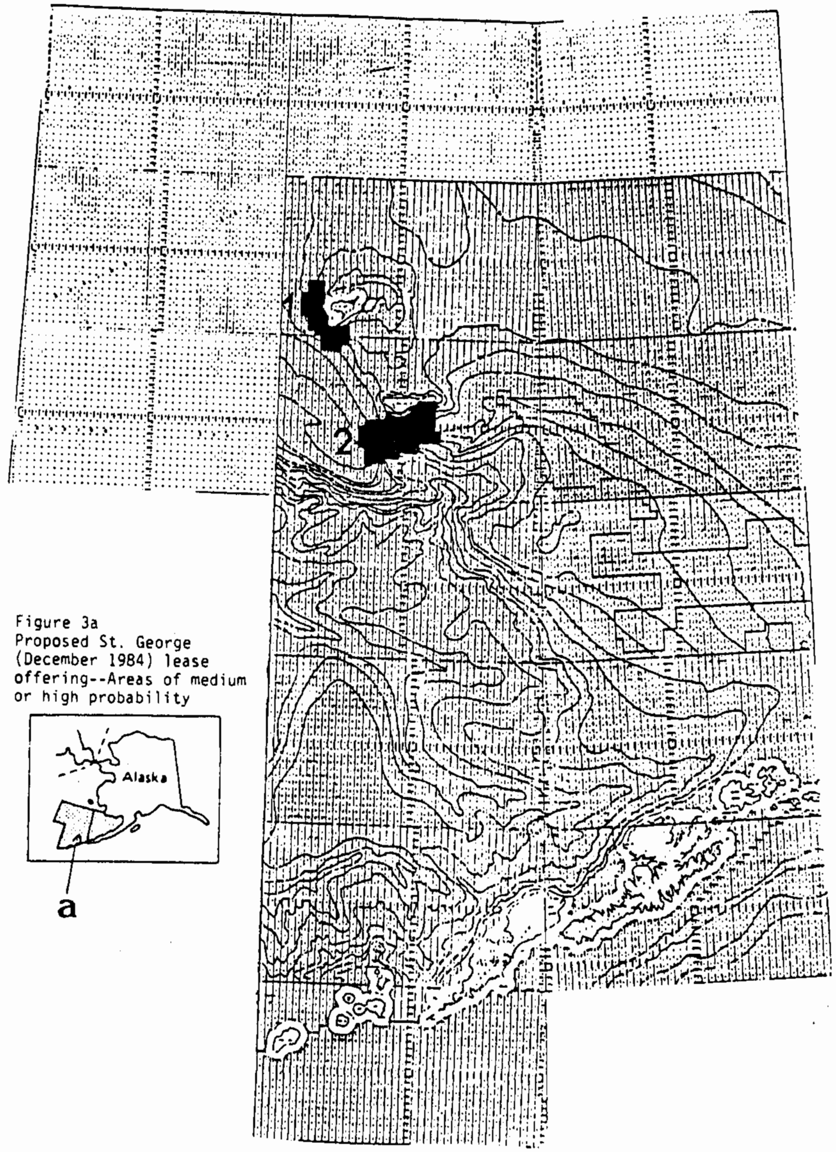


Figure 3a
Proposed St. George (December 1984) lease offering--Areas of medium or high probability

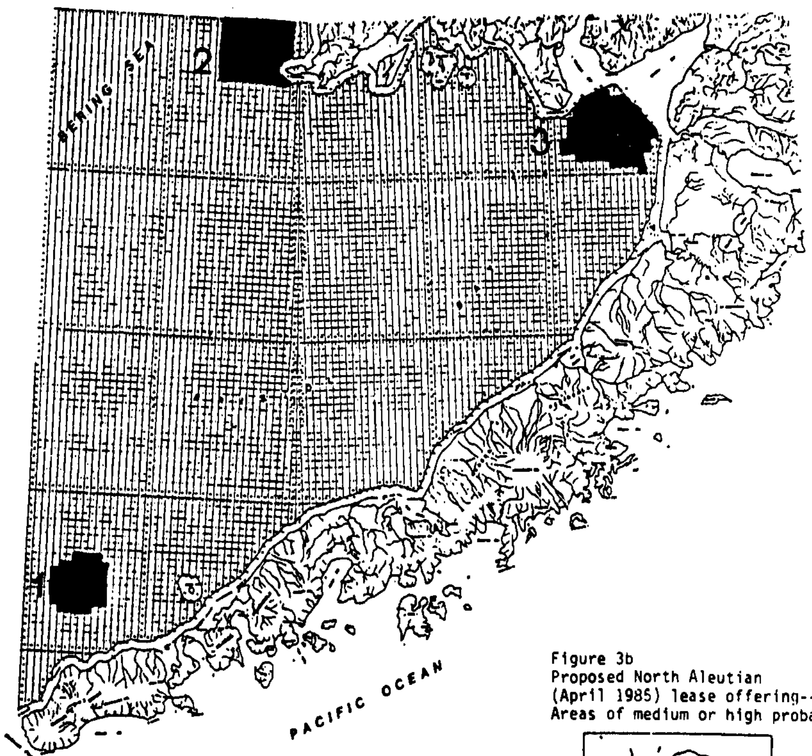
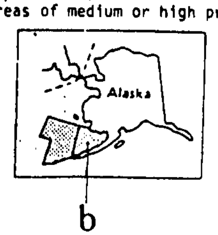


Figure 3b
Proposed North Aleutian
(April 1985) lease offering--
Areas of medium or high probability



productive (and consequently less likely to foster winter settlements) as those listed above.

2. North- and south-facing slopes. Guthrie (1976) indicated that south-facing slopes tend to concentrate grazing mammals during early spring plant maturation and that many times north-facing slopes provide wind-blown, snow-free winter ranges. However, neither of these habitat types concentrate grazers into specific locations where large aggregates of animals can be harvested. Although these areas are generally more productive, the mammals are scattered over a comparatively large area.

Step 2--Review of Sea Level Curves to Determine Habitability

The second step is to examine the regional sea level curves. Dixon et al. (1976) state that ", [D]uring the Quaternary period, Beringia was intermittently invaded by sea and ice. The sea level fell as much as 100-150 meters below its present level. . . ." A recently published volume (Hopkins et al., 1982) reexamines the body of literature dealing with sea level changes in Beringia. It establishes that the sea level fell to a minimum depth of -90 meters, between 25,000 and 17,000 years before present (B.P.). It is the latter figure, -90 meters which will be utilized in this analysis as one factor to determine habitability. Hopkins et al. (ibid) do not disagree with the earlier interpretations of global sea level having been -125 meters stating: " . . . the position of the ancient shoreline on any given segment of the continental margin differs as a result of local differences in tectonic history and local isostatic effects." They feel that Beringia deviated significantly from the worldwide norm. Using these data, numerous blocks in the lease offering area would not have been emergent (Table 1 and Figure 4a and b).

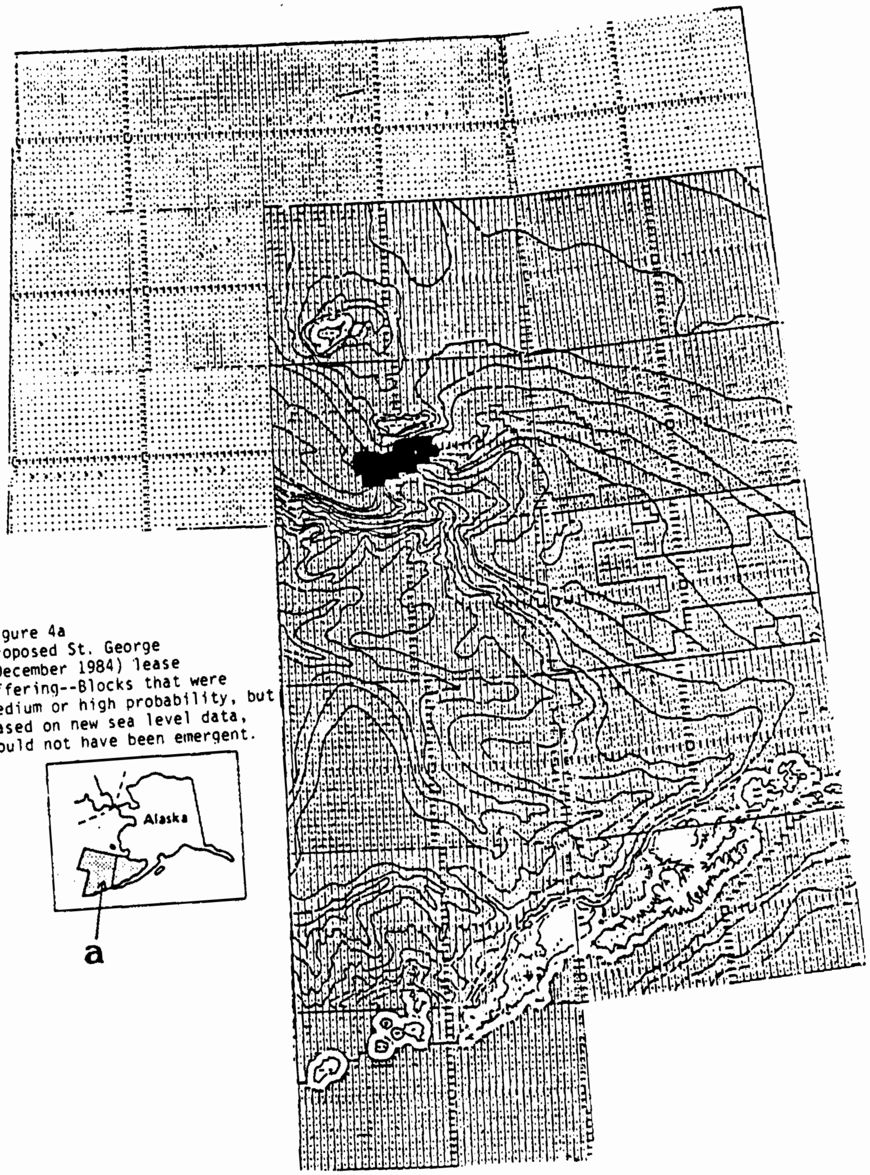


Figure 4a
Proposed St. George (December 1984) lease offering--Blocks that were medium or high probability, but based on new sea level data, would not have been emergent.

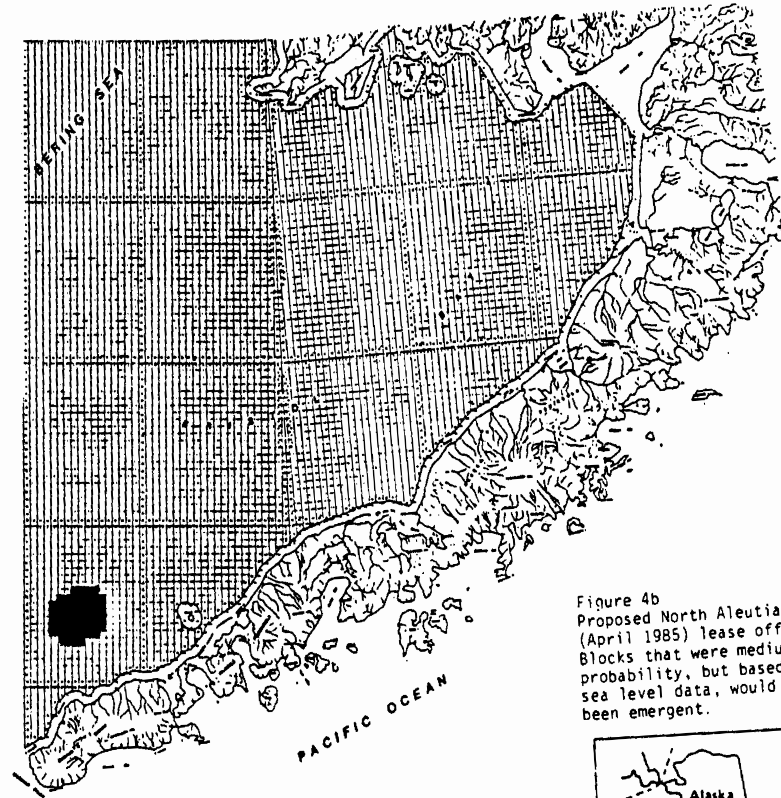


Figure 4b
Proposed North Aleutian (April 1985) lease offering--Blocks that were medium or hig probability, but based on new sea level data, would not have been emergent.

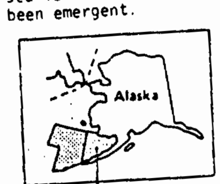


Table 1. Blocks that were medium or high probability, but based on new sea level data, would not have been emergent.

Protraction Diagram	Block Number
NO 2-8	379, 423, 466, 467, 498, 508-512, 541, 542, 548-555, 585-597, 630-638, 674-679, and 718-720
NN 3-2 (Cold Bay)	360-364-, 402-409, 445-453, 489-497, 33-541, 577-585, 621-628, 665-671, and 710-714

Step 3--Review of the Geological/Geophysical Data to Determine Survivability

Step 3 is to use ". . . information regarding forces or processes that might have destroyed potential prehistoric sites or rendered them unrecoverable." Dixon et al. (1976) focused on the probability of paleo-Indian populations inhabiting the offshore Bering Sea area prior to the postglacial marine transgression. This report also identified topographic features and areas based on paleogeography, paleoenvironment, and probable biomass productivity that these prehistoric groups would have sought to occupy and, in a general way, identified such areas and features within the Bering Sea area. Refinement of this study (Dixon et al., 1976) is necessary in order to further evaluate whether the medium/high probability areas have survived and can be detected using current geological/geophysical survey methods. We do not dispute the idea that this offshore area may have been inhabited by paleo-Indian groups or that they selected specific features for occupation. We point out that (a) many of the prehistoric sites did not survive the transgression, (b) some of the topographic features that were occupied are no longer recognizable, and (c) some of these features are not detectable.

According to numerous researchers such as Hopkins, 1959; Scholl et al., 1968; Sharma, 1972; Sharma et al., 1972; Knebel and Creager, 1973; Hickok, 1974; Sharma, 1974; Marlow et al., 1976; Gardner et al., 1979; Colinvaux, 1981; Hopkins, 1982; Marlow and Cooper, 1982, the probability of a prehistoric site surviving

intact is fairly low owing to the combined process of (a) long-term erosion due to extreme flatness and gentle slope of most of the shelf floor; (b) bottom turbulence due to shallow shelf depth; (c) scouring due to ice pile up along shoreline; and (d) erosion due to lack of protection because of insufficient sediment cover and bedrock exposure on the bottom.

We have briefly summarized some of the significant geological and geophysical research conducted in the southeastern Bering Sea. Based on the accumulated data, it is our position that few prehistoric sites would have survived the marine transgression. Those that did survive, would be subjected to subsequent destructive processes such as swift spring thaw outwash, rapid sedimentation, sediment slumping, and dynamic current and wave erosion.

Step 4--Review to Identify Significant Landforms

Step 4 calls for the examination of the ". . . geology report, appropriate hazard survey, etc., . . ." to determine the likelihood of significant landforms and the habitability and survivability of possible sites. Examination of numerous high resolution seismic profiles can indicate whether the remaining block areas could have been inhabited and, if so, if sites would have survived. Appendix 1 summarizes the information used in the habitability and survivability analyses.

1. Habitability Analysis

According to archeological information collected and analyzed over the last 50 years for the lease offering area, early man was most likely to have inhabited areas now identified as drowned stream canyons, ancient estuaries/lagoons, and channel-filled bays. Contrariwise, wide, gently sloping beach front areas were not often occupied due to lack of protective landforms, freshwater streams, or abundant food sources.

Topographic and bathymetric maps as well as high resolution profiles were studied to determine those blocks which do contain such significant landforms. Those which do not contain significant landforms are exempt from further cultural resource considerations (Table 3 and Figure 5a and b).

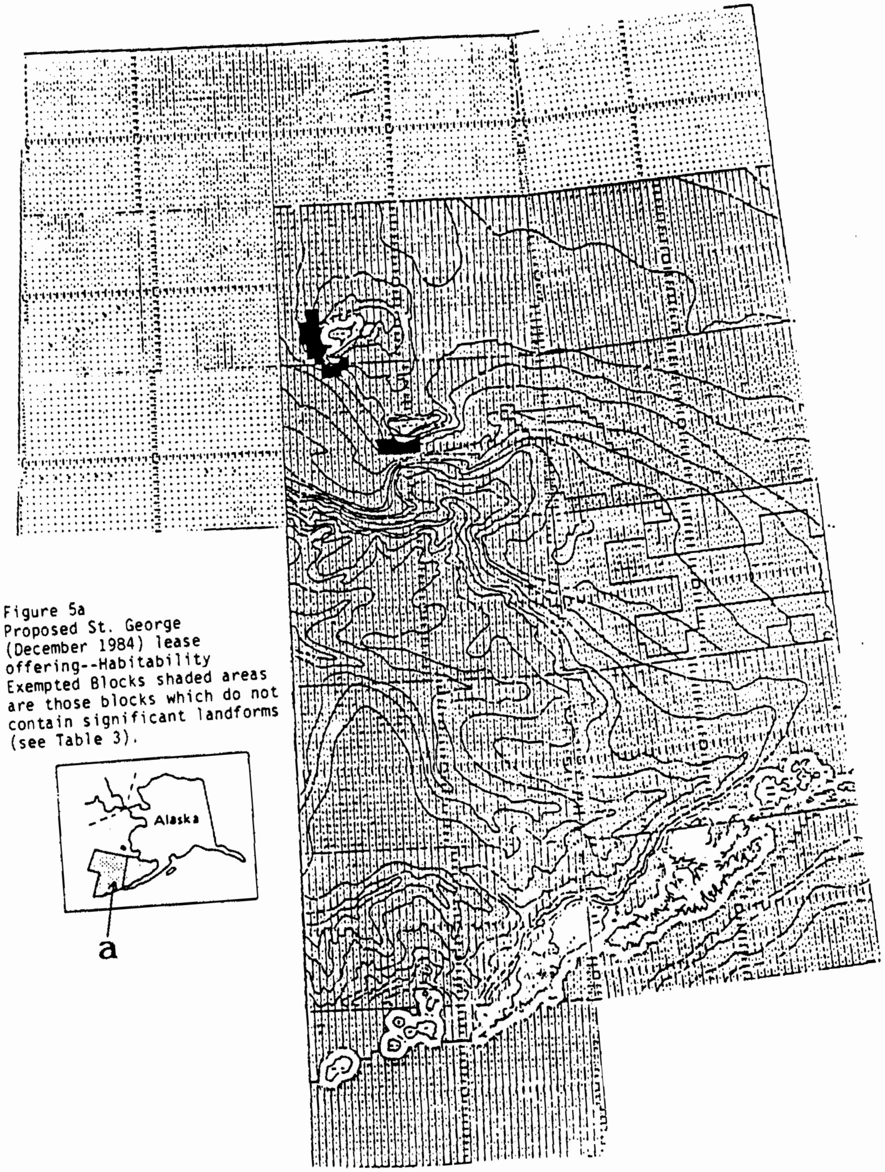


Figure 5a
Proposed St. George (December 1984) lease offering--Habitability Exempted Blocks shaded areas are those blocks which do not contain significant landforms (see Table 3).

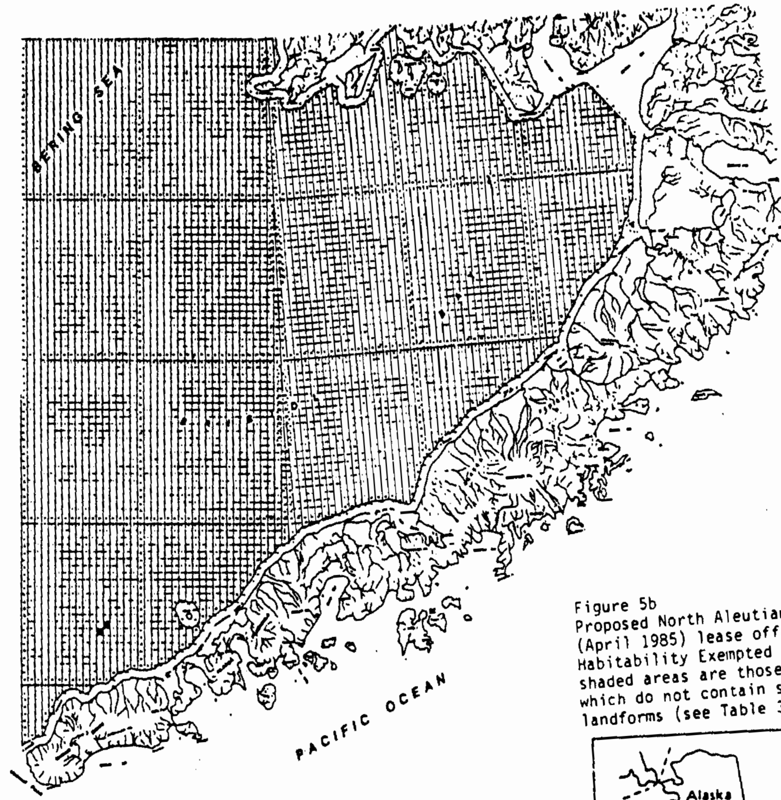


Figure 5b
Proposed North Aleutian (April 1985) lease offering--Habitability Exempted Blocks shaded areas are those blocks which do not contain significant landforms (see Table 3).

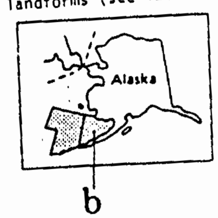


Table 3. Habitability--Blocks exempt from survey report due to lack of significant landforms.

Protraction Diagram	Block Number
St. Paul (NO 2-6)	665, 666, 709, 710, 752-754, 796-799, 840-843, 885-888, 929-931, 974-978
St. George (NO 2-8)	7-10, 51-53, 457, 499-504, 543-548
Cold Bay (NN 3-2)	629, 672

Survivability Analysis

The remaining blocks determined to be habitable are examined again using the survivability criteria (Step 3). Wide, gently sloping shelf areas are unlikely to have survived the marine transgression because of the high energy erosion of the seas reworking the ancient beaches.

Likewise, former high energy shores that lack a protective sediment cover also have a low probability for prehistoric site survivability. Thus, potential prehistoric site areas with little or no Holocene sediments or with bedrock exposed within the entire block would not have survived. The blocks that fall within this category are noted in Table 4 and Figure 6.

Table 4. Survivability--Blocks exempt from survey report due to lack of enough Holocene sediments for site protection and preservation.

Protraction Diagram	Block Number
St. George	375-378, 417-422, 460-465, 505-507

Due to the dynamic processes and the adverse forces in action in the lease offering area documented above, many landforms are no longer recognizable. Blocks containing landforms that are recognizable, having survived the dynamic

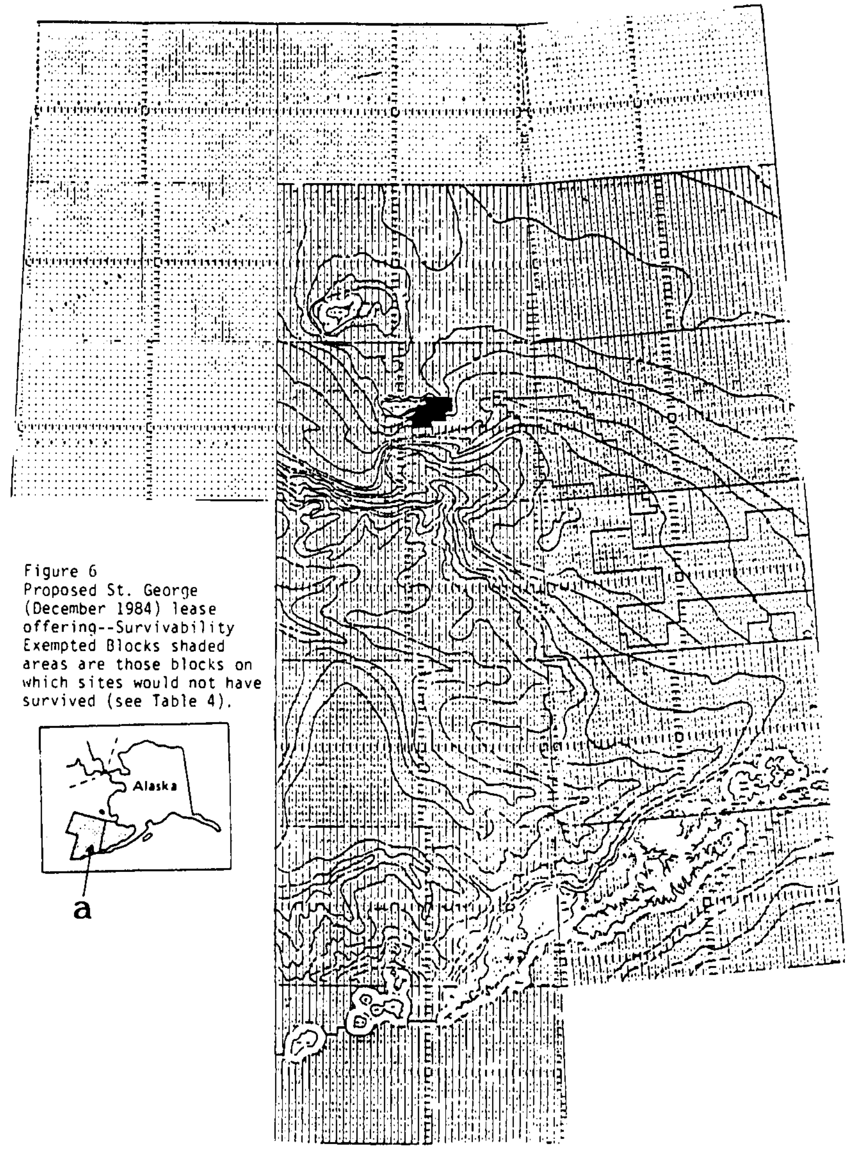


Figure 6
Proposed St. George (December 1984) lease offering--Survivability Exempted Blocks shaded areas are those blocks on which sites would not have survived (see Table 4).

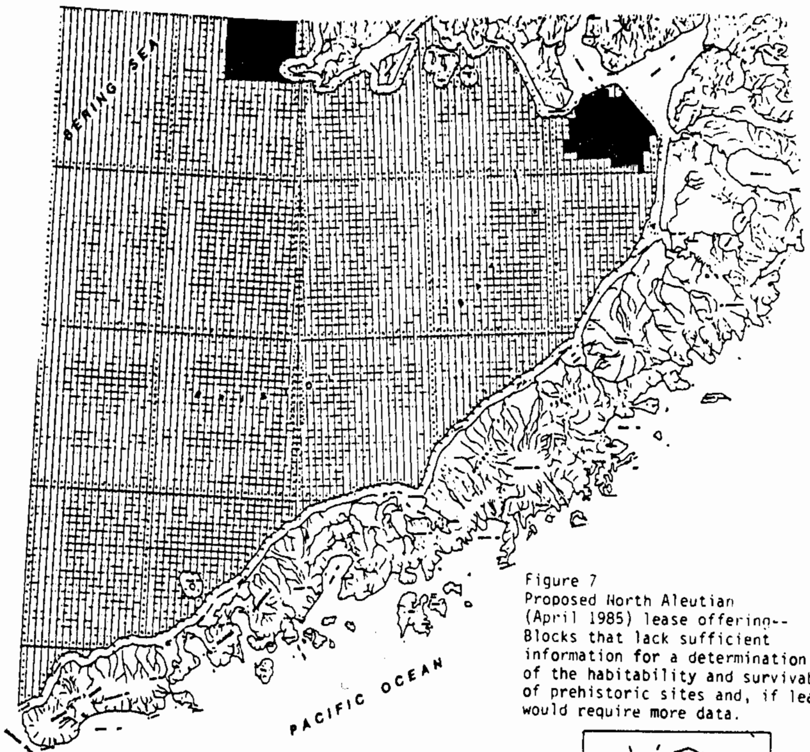
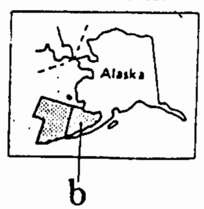


Figure 7
Proposed North Aleutian (April 1985) lease offering--Blocks that lack sufficient information for a determination of the habitability and survivability of prehistoric sites and, if leased, would require more data.



processes or marine transgression, sedimentary burial, and erpsion, have a high potential for a prehistoric site and may require a cultural resource report.

Because of the dearth of seismic data in the southeastern Bering Sea area (North Aleutian Basin) and the uncertainty of the sub-bottom interpretation, a determination cannot be made as to whether landforms have survived erosion and still exist (Appendix 1). Therefore, Table 5 and Figure 7 list those blocks that lack sufficient information to determine whether a prehistoric site exists and would require more survey information (e.g., hazards, data) if leased.

Step 5--Prehistoric Site Potential Recommendation

Step 5 calls for the integration of all available data and information in order to make a recommendation on which blocks should be designated as having a high probability for prehistoric sites.

As a result of the five-step assessment, we find that 68 medium or high probability blocks do not (a) have the potential for prehistoric sites, (b) contain landforms significant for human habitation, or (c) contain enough Holocene sediments for site protection and preservation. The prehistoric site report requirements should not apply to these blocks and are indicated as exempt in Tables 3 and 4 and Figures 5a and b, 6a and b. Those blocks that are not exempt owing to lack of sufficient information (201 blocks) are indicated in Table 5 and Figure 7. If leased, these blocks would require more data to allow for determination of habitability and survivability of prehistoric sites. The postlease data would be examined by an MMS archeologist and geophysicist and a report prepared.

Table 5. Blocks that lack sufficient information for a determination of the habitability and survivability of prehistoric sites and, if leased, would require more data (e.g., hazards survey).

Protraction Diagram	Block Number
NO 3-4	26-35, 70-79, 114-123, 158-167, 202-211, 246-255, 290-298, 334-342, 378-387
NO 4-4	492, 493, 533-540, 577-586, 621-631, 664-676, 708-720, 752-765, 795-807, 639-651, 885-894, 934-938, 982

If new data become available, this analysis could be refined to further assess which blocks would require a prehistoric site report.

Appendix I

Prehistoric Site Survival in the Southeastern Bering Sea

The survival of a prehistoric site on the continental shelf of the southeastern Bering Sea is determined by erosion processes that depend on one or more of the following bottom factors unique to this area: (1) the extreme flatness and gentle slope of the shelf floor, (2) the shallow depth of the shelf, (3) the pile up of shore ice due to winter storms, and (4) the lack of sufficient sediment cover and the exposure of bedrock on the bottom.

Bottom Factors Limiting Prehistoric Site Survival

The first factor (a gentle slope) allows a long period of time over which wave erosion can take place during a sea transgression. This erosion process would disturb and eventually destroy any surface prehistoric site. Additionally, onshore sediment deposition is extremely limited so the likelihood of any site surviving, because it was protected by sediments, is low.

The second factor (shallow depth-averaging 70 meters) limits the development of long-wave lengths which in turn limits the wave heights. The limitation of wave height (about 10 meters) causes many waves to break long before reaching the shore and consequently contributes to bottom turbulence. Frequent storms in this area generate waves about 200 meters long and 10 meters high, which significantly influence the bottom to a depth of about 94 meters (Sharma, 1972). Shallow water waves influence the bottom when the depth is less than one-half the wave length. The effect of deep wave motion on the bottom would tend to destroy, through churning, any prehistoric sites on the shelf floor.

The third factor (winter storms tend to pile up ice on the shorelines) results in shoreline scouring and gouging where ice accumulates. During the winter months (December to April) 10 to 70 percent of the southern Bering Shelf is ice covered depending on the severity of the weather (Sharma, 1979). The scouring occurs when ice is thickest and this reaches its maximum during March and April when unstressed floes reach 1 or 2 meters (Marlow et al., 1982). Many ice scour areas were observed to depths of 90 meters during several offshore surveys along the northern coast of the Alaska peninsula (Molnia et al., 1983). Ice scouring along shoreline beaches over a long period of time would be a significant factor in the destruction of prehistoric sites.

The fourth factor (the exposure of bedrock on the seabottom and the lack of sufficient sediment cover) would indicate that a potential prehistoric site was subjected to erosional processes that could destroy it. Holocene sediments are generally thin--only 3 to 4 meters over most of the southeastern Bering Sea shelf (Askren, 1972). The existence of bedrock and lack of landforms applies to the area around the Pribilof Islands.

<u>Lease Offering Areas</u>

Five subareas within the proposed offering area (two in St. George Basin and three in North Aleutian Basin, Figures 1a and 1b) were designated as having a medium or high probability for containing prehistoric sites (Dixon et al., n.d.). These areas were further analyzed to determine whether any sites could have survived and be detected.

<u>St. George Basin</u>

Seismic data (Moore, 1962; Askren, 1972; Gardner and Vallier, 1977; Gardner and Vallier, 1978; Cooper et al., 1982) indicates that the two subareas in the St. George Basin (St. Paul and St. George Islands) do not have enough sediments or significant landforms for prehistoric site preservation. The area west of St. Paul Island (Figure 1a-1) has a thin layer of sediments (Holocene) but no landforms. The area to the east of St. George Island (Figure 1a-2) has a bumpy, bathymetric configuration which is interpreted by this author to be bedrock (ancient volcanics) with little or no sediments. The area to the southwest of St. George Island has a smooth, thin layer of sediments but no significant landforms.

The assessment of this author regarding the probability of survival of prehistoric sites in the St. George planning area is that there is only a low probability that a prehistoric site could have survived the destructive effects of the transgressive Holocene seas; therefore, a survey report should not be required for any of the blocks in this area (see Archeological Analysis Tables 3 and 4).

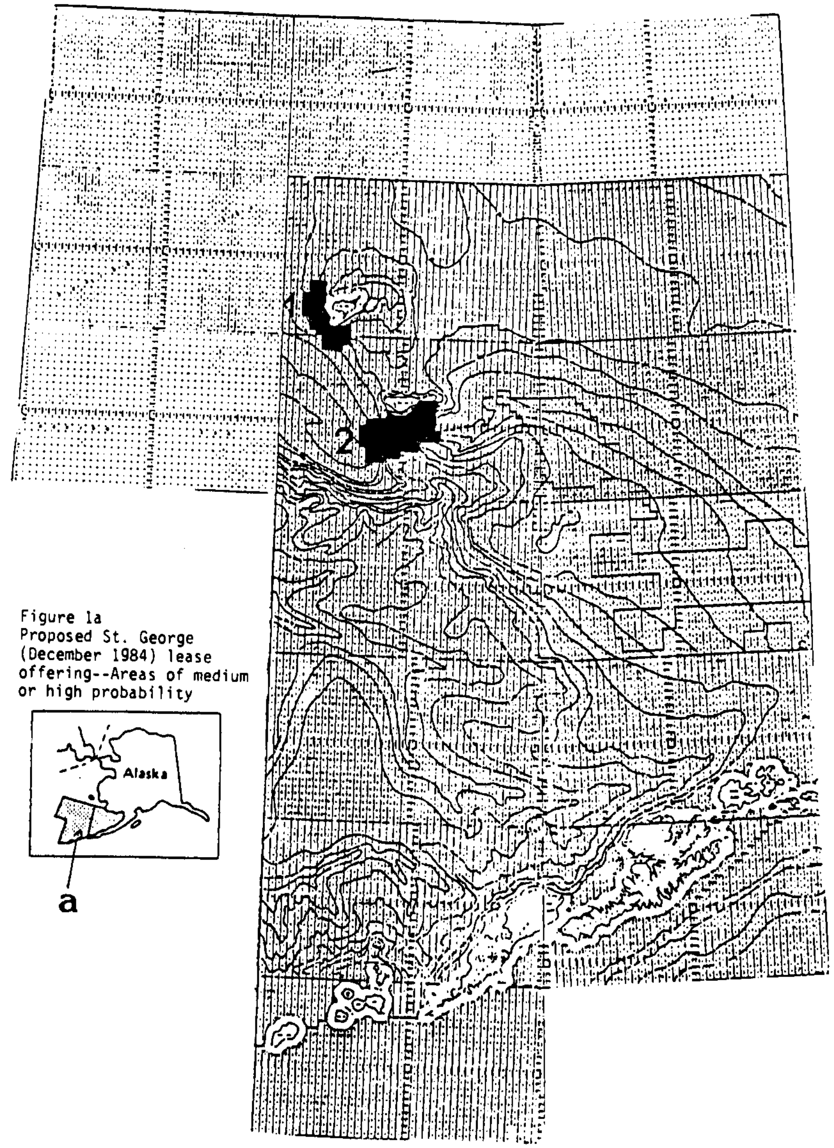


Figure 1a
Proposed St. George (December 1984) lease offering--Areas of medium or high probability

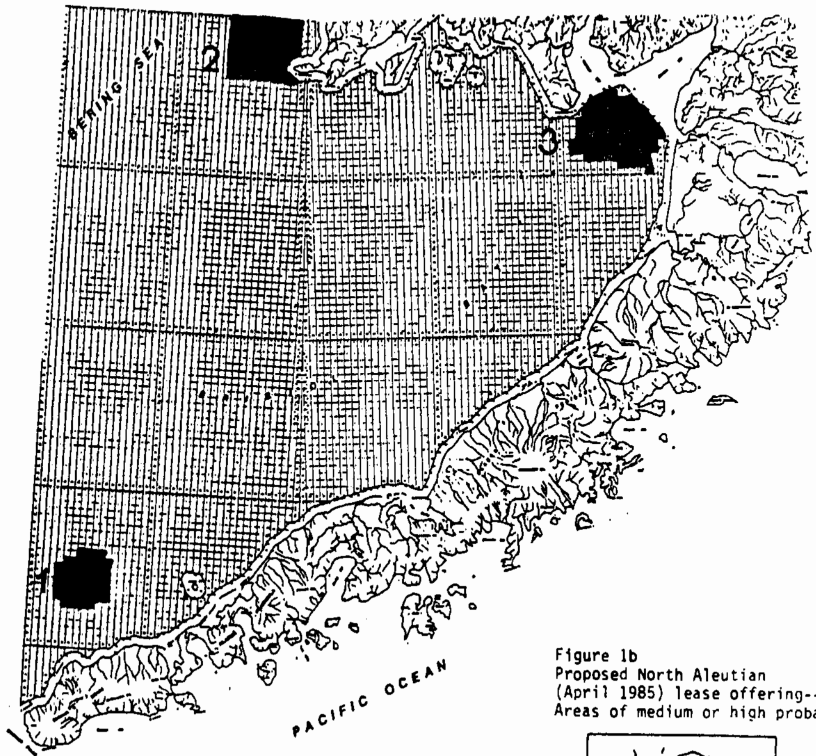
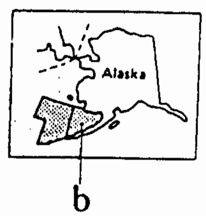


Figure 1b
Proposed North Aleutian
(April 1985) lease offering--
Areas of medium or high probabilit



North Aleutian Basin

An assessment of the probability of survival of prehistoric sites in the three subareas in the North Aleutian Basin is not as definitive as in the St. George Basin due to the dearth of data.

The area north of Unimak Island (Figure 1b-1) has only two blocks with depths less than 90 meters. Both blocks have flat bottom sediments with gradual slopes where wave action from long-term transgressive seas coupled with later bottom wave motion and ice scouring would surely have eroded or destroyed any prehistoric site. Also, no significant landforms are indicated on these blocks, therefore, a survey report should not be required for any of the blocks in this area (see Archeological Analysis Table 3).

Areas Lacking Sufficient Data

There are very little data in the two subareas in the North Aleutian Basin: (1) west of Cape Newenham (Kuskowim Bay Figure 1b-2) and (2) south of Kvichak Bay (Figure 1b-3). Askren (1972) and Sharma (1979) indicate that there may be ancient channeling in these areas as modern contoured channels are shown on bathymetric maps throughout the two areas (Creager and McManus, 1967, and USGS Topographic Maps: Kuskokwim Bay (Rev. 1969), Nushagak Bay (Rev. 1973), Naknek (Rev. 1981)). Bottom contours within the general North Aleutian Basin indicate that the modern Kuskokwim, Nushagak, and Kvichak Rivers flow along the south side of Bristol Bay bounded by the Alaska peninsula, through the Bering Canyon and into the abyssal Bering Sea. This follows the Pleistocene drainage pattern of these rivers during lowered sea level (Nelson et al., 1974).

Inconclusive Information

Both Kvickick and Kuskokwim bays contained braided streams during lower sea stands. Even though spring thaws cause swift swollen stream action, with massive erosional potential, there may be some Holocene sedimentation along channels that could protect a prehistoric site. The only seismic data in these two areas are from surveys conducted by Askren (1972), which gives inconclusive information on the detection of subsurface landforms. These two areas are part of what Askren calls the "disturbed zone" which is characterized by a lack of seismic sub-bottom continuity indicating a lack of sediment layering due to random mixing. He indicated that the reworking of the sediments by tidal, wind-wave, and permanent currents is responsible for the lack of sub-bottom continuity in the acoustic-profiling records shallower than 35 meters depth. He states that several bathymetric valleys and erosional features suggestive of river courses are seen in sub-bottom records, but that the shallow penetration of sound and the shallow core samples did not yield sufficient data to allow the correlation of these features with Holocene drainage systems.

An analysis of past lease hazards survey data should be sufficient to determine whether there are existing landforms that would indicate a prehistoric site.

Poor Sub-bottom Data

Askren (1972) mentions the uncertainty of determining the origin of a topographic high bordering the channel south of Kuskokwim Bay because of the blanketing by a strongly reflective sand layer which prevents effective shallow profiling below. He suggests that the topographic high may represent a constructional feature formed during the late Holocene.

A single frequency, 4,000 Hertz, sub-bottom profiler was used to survey the shelf. This system gives high resolution data but poor sub-bottom penetration. Strongly reflective compact sands might be better penetrated by a multi-frequency system such as a "boomer." The MMS Regional Manager should recommend that a "boomer" be utilized for better sub-bottom penetration if the blocks in this area are leased.

Postlease Data Examination

Because of the incomplete seismic data in the Kuskokwim and Kvichak Bay areas, a determination cannot be made as to whether landforms have survived the Holocene erosional processes and still exist. Therefore, if any of these blocks are leased, postlease hazards survey data must be examined by an MMS archeologist and geophysicist and a survey report prepared.

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Table J-1
Onshore Historic and Prehistoric
Sites of the North Aleutian Basin (Sale 92) Lease Area

Alaska Heritage Resources File (Quadrant No.) 1/	Name	Dating
XSI 001-010	Numbered Only	2/
XSB 001	Mitrofania	2/
XSB 002	St. Metrophan Cape	2/
XSB 003	St. John Theology	2/
XSB 004	Fishing Station	2/
XSB 005	Fox Farm	2/
XSB 006	NG-12	2/
XSB 007	BR-11	2/
XPM 001 3/	Port Moller V.S.	BC 3000
XPM 002	Unga Island	AD 1871
XPM 003	Apollo	AD 1899
XPM 004	Coal Harbor	AD 1902
XPM 005	Korovinsky	AD 1700
XPM 006	Delarof Harbor	AD 1700
XPM 007	St. Nicholas Cape	2/
XPM 008	Theo Kazan Church	2/
XPM 009	St. Vladimir Church	2/
XPM 010	Holy Ascension Church	2/
XPM 011	Cod-Fishing Station	AD 1909
XPM 012	Fishing Station	AD 1900
XPM 013	Fishing Station	AD 1916
XPM 014-17	Numbered Sites Only	2/
XPM 018	Fishing Station No. 2	2/
XPM 019-027	Numbered Sites Only	2/
XFP 001	Morzhovo	AD 1800
XFP 002	Sannak Post	2/
XFP 003	Bechevin Bay	AD 1920
XFP 004	Isanotski Strt.	2/
XFP 005	Isanotski	AD 1920
XFP 006	Isanotski East	2/
XFP 007	Whirl Point	AD 1920
XFP 008	Ikatan Bay	AD 1920
XFP 009	Ikatan Bay East	AD 1920
XFP 010	Ikatan Peninsula	AD 1920
XFP 011	Otter Cove	AD 1920
XFP 012	Cape Aksit	AD 1920
XFP 013	Lazaref Peak	AD 1920
XFP 014	Cape Lazaref	AD 1920
XFP 015	Ikatan Peninsula S.E.	2/
XFP 016	St. Nicholas Cape	2/
XFP 017	Holy Ascension Church	2/
XFP 018	Church of Theo	2/
XFP 019	Cannery	AD 1900
XFP 020	Samak Post Office	AD 1909

Table J-1
Onshore Historic and Prehistoric
Sites of the North Aleutian Basin (Sale 92) Lease Area
(cont.)

Alaska Heritage Resources File (Quadrant No.) 1/	Name	Dating
XFP 021	SI-4	
XFP 022	Samak Harbor	AD 1778
XFP 023	PN-44	2/
XFP 024	PN-45	2/
XFP 026	Bendixen Fur Farm	2/
XCB 001	IZM-1	AD 1050
XCB 002	IZM-2	AD 1190
XCB 003	IZM-3	AD 880
XCB 004	Stein's PN-43	2/
XCB 005	Izembek Lagoon	BC 3000
XCB 006	Outer Marker	2/
XCB 007	Belkofski Post	2/
XCB 008	Coal Oil Creek	AD 1920
XCB 009	Coal Oil Village	2/
XCB 010	Otter Pt. N.W.	2/
XCB 011	Otter Pt. Cabin	2/
XCB 012	Otter Pt. N.E.	AD 1920
XCB 013	Swanson Lagoon N.W.	AD 1920
XCB 014	Swanson Cabin	AD 1920
XCB 015	Swanson Lagoon N.E.	AD 1920
XCB 016	Swanson Village	2/
XCB 017	St. Catherine C.V.	AD 1920
XCB 018	Chunak Point	2/
XCB 019	Cabin	AD 1920
XCB 020	Holy Resurrection Church	2/
XCB 021	Kinzarf Lagoon W.	2/
XCB 022	Bricher Site	2/
XCB 023-031	Numbered Only	2/
CHK 001	St. Nicholas Chapel	2/
CHK 002	Port Heiden Church	2/
CHK 003	St. Nicholas Chapel	2/
CHK 004	Chignik Lagoon Village	AD 1800
CHK 005-015	Numbered Sites Only	approx. 1900
CHK 016	Chignik Spit	2/
CHK 017	Village	2/
CHK 018	Bear River	2/
CHK 020-027	Gary Stein 14H Selections (Onsaka)	2/
SUT 003	Sutawik Post	AD 1700
SUT 004	Kvichak	AD 1880
SUT 005	Aniakchak	2/
UNI 001	Lost Harbor	AD 1920
UNI 002	Artelnov	AD 1834

Table J-1
Onshore Historic and Prehistoric
Sites of the North Aleutian Basin (Sale 92) Lease Area
(cont.)

Alaska Heritage Resources File (Quadrant No.) 1/	Name	Dating
UNI 003	Akun Strait	BC 2000
UNI 004	Unimak Island	2/
UNI 005	Ugamak Island	AD 1820
UNI 006	Unimak Post	AD 1700
UNI 007	Cape Sarichef	2/
UNI 008	No Name	2/
UNI 009	Tigalda Site	2/
UNI 010	Avatanak	2/
UNI 011	Rootok	2/
UNI 012	Chulka	2/
UNI 013	Oslelo	2/
UNI 014	Akun Head	2/
UNI 015	Akutan	2/
UNI 016	Raven Point	2/
UNI 017	Pogrammi River	2/
UNI 018	Urilia Bay	2/
UNI 019	Big Dune	AD 1900
UNI 020	Urilia Cabin	AD 1900
UNI 021	Urilia Bay	AD 1900
UNI 022	Cataract Cove	AD 1900
UNI 023	Sea Lion Point	AD 1900
UNI 024	Promontory Hill	AD 1900
UNI 025	Unimak Bight N.W.	AD 1900
UNI 026	Unimak Bight	AD 1900
UNI 027	Unimak Island N.W.	AD 1900
UNI 028	St. Alex Nevsky	2/
UNI 029 3/	Cape Sarichef	AD 1904
UNI 030	Scotch Cape Lite	AD 1903
UNI 031	Broad Bight	2/
UNI 032-34	Bank's Sites	2/
UNI 035	Old Akun	2/
UNI 036-050	Bank's Sites	2/
UNI 051	Roadcut Site	2/
XNB DIL-035	Pilgrim 100B Aircraft (Still Flying)	AD 1929

Source: Alaska Heritage Resources File, 1985.

1/ XSI=Simeanoff Island, XSB=Stepovak Bay.
XPM=Port Moller, XFP=False Pass.
XCB=Cold Bay, CHK=Chignik, SUT=Sutvik.
UNI=Unimak Pass.
DIL=Dillingham.

2/ Date unknown.

3/ National Register Site.

APPENDIX K

Alaska OCS Regional Studies Program

Prepared by

Minerals Management Service

Appendix K

1. <u>Environmental Studies Program</u>: In each offshore area proposed for oil and/or gas development, extensive environmental studies are conducted before such development is allowed. Since 1974, studies of the Alaskan Outer Continental Shelf (OCS) have taken place under the auspices of the Outer Continental Shelf Environmental Assessment Program (OCSEAP). This program is conducted under interagency agreement between the Minerals Management Service (MMS) of the Department of the Interior and the National Oceanic and Atmospheric Administration (NOAA) of the Department of Commerce. (Prior to the establishment of the Minerals Management Service in 1982, all functions of the OCS programs were under the Bureau of Land Management.) In addition, the Alaska OCS Region Environmental Studies Program of the MMS conducts studies of certain endangered and nonendangered species. Studies are also conducted by the MMS offices in other regions which may be applicable to this EIS.

The OCSEAP research in the North Aleutian region began in 1975 and has continued at a relatively high level. The studies have assembled historical information and collected new data. Research topics and objectives of the Alaska OCS Region's Environmental Assessment Program are described below.

Contaminant Distribution

These studies are intended to establish predevelopment hydrocarbon and trace metal concentrations in the water column, sediments, and biota of OCS regions.

Geologic Hazards

Geologic hazards to petroleum-related activities center around seismicity, surface and near-surface faulting, sediment instability, erosion and deposition, and stratigraphy.

Many hazards present in Alaska lease areas also occur in other U.S. shelf areas; however, in Alaska, these problems are unique in terms of severity and complexity. A knowledge of the nature, frequency, and intensity of severe environmental events is essential.

Seismic field studies began in fiscal years 1975 and 1976 to supplement existing studies being funded by other agencies. The Bureau of Land Management (BLM) directly supported part of the seismic program in a U.S. Geological Survey study, employing a land-based network of seismographic stations. All geohazard studies conducted by the University of Alaska were funded through BLM/OCSEAP. The major objectives of these seismic studies were to determine a probability scale for earthquake hazards and to improve the statistical reliability of the existing data base. This was accomplished through continuation of present observational programs and use of additional or improved instrumentation, such as ocean-bottom seismometers and strong-motion accelerometers.

Shelf-faulting and sedimentation studies were conducted to define potential hazards so that environmental risks could be reduced by outright avoidance or by appropriate regulation of facility siting, design, and construction. Certain geologic features, identified as potentially troublesome during regional reconnaissance of the proposed lease area, were studied in further detail. Shelf-faulting and sedimentation studies began in fiscal year 1975. The studies produced basic information on geologic hazards of the area, including location of probable active faults, potentially unstable sediments, and erosion and deposition areas on the shelf.

Pollutant Transport

Transport and transformation (weathering) of petroleum-related contaminants are significant considerations in an assessment of potential effects of offshore developments. Petroleum and other contaminants introduced into the environment can be transported in the atmosphere, in the water column, and by sea ice. During transport, contaminants undergo continual physiochemical changes, such as evaporation, flocculation, emulsification, weathering, biodegradation, and decomposition.

Transport studies are designed to provide information that will enable the Department of the Interior and other agencies to (1) plan stages and siting of offshore petroleum development to reduce potential risks to sensitive environments; (2) provide oil-spill trajectories, coastal landfall, and effects of oil-spill cleanup operations; and (3) assist in planning the location of long-term environmental-monitoring sites in the study area.

Long-term, direct measurements of coastal winds and currents in the North Aleutian Basin area have been performed by OCSEAP. Transport studies were designed to proceed from a regional description of oceanographic and meteorological features to analyses of processes. Oceanographic investigations included literature summaries, current measurements, hydrographic-station data, remote data sensing, and computer simulation of coastal-wind patterns.

The oceanographic studies lead in part to an oil-spill-trajectory model, which is the basis of the Oil-Spill-Risk-Analysis that is described in Section IV.A.3.

Biological Resources

A major reason for conducting biological population studies in the North Aleutian Basin was to determine which populations, communities, and ecosystems are at risk from either acute or chronic oil spills.

Studies of animal distribution and abundance, migration patterns, feeding sites, and population behavior are used to identify potential ecological sensitivity and vulnerability and to support descriptive/predictive analyses in this EIS. Site-specific "process" studies give further details on trophic and population interactions, disturbance sensitivity, habitat dependency, and physiological characteristics of unique or potentially sensitive biological communities.

Research on Effects

Studies of the effects of oil, drilling discharges, and disturbances on marine organisms and populations are continuing. The research is often applicable to several OCS areas. The results are used to predict possible long-term causal relationships between OCS-related activities and biological/chemical changes and to help develop stipulations and regulations which may mitigate effects. The studies program is also supporting research on effects to determine potential early-warning indicators that may be useful in detecting and quantifying environmental changes during monitoring of OCS development.

Studies List - North Aleutian

Table K-1 is a list of environmental studies conducted in the OCS areas under the MMS/OCSEAP environmental studies program. This appendix shows the subject or title, principal investigator(s), research unit number (RU), and year(s) of funding for studies identified as directly or indirectly contributing to the data base relevant to this proposed lease sale. Included in this list are studies contracted by OCSEAP and certain endangered-species investigations contracted by the MMS, Alaska OCS Region Leasing and Environment Office. Environmental assessments of effects made in this EIS are likely to use a broader data base than the studies listed in Table K-1; for example, additional studies conducted by other MMS offshore leasing offices and other federal, state, or international agencies may be pertinent data sources.

2. Social and Economic Studies Program: The Social and Economic Studies Program (SESP) of the MMS, Alaska OCS Region was created to determine and assess the potential onshore economic, social, and cultural effects from offshore oil and gas development. As a multiyear, multidiscipline program, SESP conducts studies on the economic, social, and cultural aspects of diverse groups. The SESP focuses on an ongoing investigation of the development process. This investigation begins with the assembly of baseline information and hypothetical development scenarios and continues through the monitoring of project development as it affects specific communities, regions, and the state as a whole. In addition, the program conducts special studies which provide region-specific information rather than lease-sale-specific information.

The analysis in this EIS draws upon numerous studies conducted specifically for the proposed North Aleutian Basin (Sale 92) other lease sales in the Bering Sea and other special studies. Table K-2 contains a list of these studies.

Studies conducted for the lease area ranged from an analysis of the petroleum development scenarios (outlining the technologies, industry costs, and supply prices of offshore hydrocarbon products) to an analysis of the local and statewide effects on employment, population, and infrastructure. Research was also undertaken to describe the effects of OCS development on transportation systems, the commercial fishing industry, and sociocultural systems--i.e. subsistence, family life, and social networks. Studies conducted for other lease areas were analyzed in some cases to provide information for the cumulative effects of the lease sales; in others, studies have provided documentation on cultural and economic effects analyzed in this EIS. These studies also have been incorporated in presale documentation for bidding systems, block evaluations, mitigating measures, secretarial issue documents, and postsale evaluations of exploration plans conducted by the Alaska OCS Region.

Table K-1

List of Environmental Studies Funded by MMS/OCSEAP for the North Aleutian Basin Area*

RU	PI	TITLE	75	76	77	78	79	80	81	82	83	84
3	Arneson, Paul	Identification, Documentation and Delineation of Coastal Migratory Bird Habitat in Alaska Final Report September 1980		X	X		X					
5	Feder, Howard	Distribution, Abundance, Community Structure, and Trophic Relationships of the Nearshore Benthos Final Report December 1981	X		X							
16	Davies, John Jacob, Klaus Bilham, Roger	A Seismotectonic Analysis of the Seismic and Volcanic Hazards in the Pribilof Islands-Eastern Aleutian Islands Region of the Bering Sea Final Report September 1983	X		X	X	X	X	X			
19	Warner, Irving	Herring Spawning Surveys - Southern Bering Sea Final Report September 1978	X	X	X	X						
24	Kaiser, R.	Razor Clam Distribution and Population Assessment Study Final Report April 1977		X	X							
29	Atlas, Ronald	Assessment of Potential Interactions of Microorganisms and Pollutants Resulting from Petroleum Development on the OCS of Alaska Final Report December 1982						X	X	X		
34	Ray, Carleton Wartzok, Douglas	Analysis of Marine Mammal Remote Sensing Data Final Report April 1977		X								
38	Hickey, Joseph	A Census of Seabirds on the Pribilof Islands Final Report February 1977	X	X								
47	Lafleur, Philip Hertz, H. S. Chesler, S. N. Basnes, I. L. Becker, D. A.	Environmental Assessment of Alaskan Waters - Trace Element Methodology - Inorganic Elements Final Report May 1977		X								

* The years marked denote when funding for this specific region took place. Study may have continued in other years without further funding or may have continued in other regions of the OCS during other years.

Table K-2

Social and Economic Studies Program Technical Reports

Technical Report	PI	Title	Date of Publication 75	76	77	78	79	80	81	82	83	84
MMS TR-60	Earl R. Combs, Inc.	St. George Basin & North Aleutian Shelf Commercial Fishing Analysis							X			
MMS TR-63	Dames and Moore	North Aleutian Shelf Petroleum Technology Assessment						X				
MMS TR-66	Peat, Marwick, Mitchell & Co.	Western Alaska Transportation Systems Analysis								X		
MMS TR-67	Payne and Associates	North Aleutian Shelf Socioeconomic Systems Baseline Analysis									X	
MMS TR-68	Institute of Social and Economic Research, University of Alaska	North Aleutian Shelf Statewide and Regional Demographic and Economic Systems Impact Analysis								X		
MMS TR-69	Alaska Consultants, Inc.	Western Alaska Local Socioeconomic Systems Analysis								X		
MMS TR-71	Earl R. Combs, Inc.	Alaska Peninsula Socioeconomic & Sociocultural Systems Analysis								X		
MMS TR-75	Impact Assessment, Inc.	North Aleutian Shelf Sociocultural Impacts, Non-OCS Analysis								X		
MMS TR-76	Louis Berger and Associates, Inc.	Forecasting Enclave Development Alternatives and Their Related Impact on Alaskan Coastal Communities as a Result of OCS Development								X		
MMS TR-77	Louis Berger and Associates, Inc.	Social Indicators for OCS Impact Monitoring									X	
MMS TR-80	Dames and Moore	Bering Sea Cumulative Economic OCS Petroleum Development								X		
MMS TR-86	Dames and Moore	Marketability of Bering Sea Natural Gas									X	
MMS TR-87	Institute of Social and Economic Research, University of Alaska	St. George Basin and North Aleutian Basin Economic & Demographic Systems Impacts Analysis										X
TR-92	Impact Assessment, Inc.	Unalaska: Socioeconomic Study & Impact Analysis									X	
TR-93	Impact Assessment, Inc.	Cold Bay: Socioeconomic Study & Impact Analysis									X	

Technical Report	PI	Title	Date of Publication 75	76	77	78	79	80	81	82	83	84
MS TR-95	Alaska Department of Fish & Game	Subsistence Based Economics									X	
MMS TR-97	Centaur Associates, Inc.	Bering Sea Commercial Fishing Industry Impact Analysis										X
MMS TR-102	ERE Systems, Inc.	North Aleutian Basin Transportation Systems Impact Analysis										X
MMS TR-109	Brown & Root Development, Inc.	Deep Water Sub-Arctic Petroleum Technology Assessment										X
MMS TR	Natural Resource Consultants	Applications of Damage Functions to Commercial Species in the Bering Sea				Ongoing Study						
MMS TR-110	Han-Padron Associates, Inc.	Offshore Loading and Pipeline Systems										X
MMS TR-108	Louis Berger & Associates	Unimak Pass Vessel Analysis										X

RU	PI	TITLE	75	76	77	78	79	80	81	82	83	84
59	Hayes, Miles Boothroyd, Jon	Coastal Morphology, Sedimentation, and Oilspill Vulnerability of the Bristol Bay Coast Final Report April 1982							X			
62	Devries, Arttrus	The Physiological Effects of Acute and Chronic Exposure to Hydrocarbons and Petroleum on the Nearshore Fishes of the Bering Sea Final Report April 1976	X	X								
67	Fiscus, Clifford Roppel, Alton	Baseline Characterization Marine Mammals Final Report December 1981	X	X	X	X						
68	Fiscus, Clifford Harry, George	Seasonal Distribution and Relative Abundance of Marine Mammals in Gulf of Alaska Final Report March 1982		X	X	X						
72	Karinen, John Rice, Stanley	Lethal and Sublethal Effects on Selected Alaskan Marine Species After Acute and Long-Term Exposure to Oil and Oil Components Final Report April 1983	X	X	X	X	X	X				
73	Malins, Donald	Sublethal Effects of Petroleum Hydro-carbons Including Biotransformations, as Reflected by Morphological, Chemical, Physiological, Pathological, and Behavioral Indices Final Report June 1982	X	X	X	X	X	X	X	X		
75	Malins, Donald	Assessment of Available Literature on the Effects of Oil Pollutants on Biota in Arctic and Subarctic Waters Final Report November 1976		X								
77	Laevastu, Taivo Favorite, Felix	Ecosystems Dynamics, Eastern Bering Sea Final Report September 1979		X								
78/79	Merrell, Theodore O'Clair, Charles Zimmerman, Steve	Baseline Characterization of Littoral Biota in the Gulf of Alaska, Kodiak and Bering Sea Final Report October 1979	X	X	X							

RU	PI	TITLE	75	76	77	78	79	80	81	82	83	84
83	Hunt, George	Reproductive Ecology of Pribilof Island Seabirds Final Report August 1981	X	X								
87	Martin, Seelye	The Interaction of Oil with Sea Ice Partial Final May 1982				X	X	X	X			
108	Wiens, John	Simulation Modeling of Marine Bird Population Energetics, Food Consumption, and Sensitivity to Perturbation Final Report February 1982	X	X								
111	Carlson, Robert	Seasonality and Variability of Streamflow Important to Alaskan Nearshore Coastal Areas Final Report March 1977	X	X								
138	Schumacher, J.	Gulf of Alaska Study of Mesoscale Oceanographic Processes			X	X	X	X				
140	Galt, Jerry	Numerical Studies of Alaskan Region Final Report 1980		X	X							
141	Coachman, L. K. Schumacher, Jim	Bristol Bay Oceanographic Processes			X	X	X					
153	Cline, Joel Feely, Richard	Sources, Composition and Dynamics of Natural and Petrogenic Light Hydrocarbons in Alaska Final Report December 1982	X	X					X	X		
162	Burrell, David	Natural Distribution of Trace Heavy Metals and Environmental Background in 3 Alaskan Shelf Areas	X	X	X							
174	Ronholt, L.	Baseline Studies of Demersal Resources of the Gulf of Alaska Shelf and Slope		X	X							
175	Pereyra, Walter	Baseline Studies of Fish and Shellfish Resources of the Eastern Bering Sea, Norton Sound, and Southeastern Chukchi Sea	X	X								
194	Fay, Francis	Morbidity and Mortality of Marine Mammal	X	X	X	X						

RU	PI	TITLE	75	76	77	78	79	80	81	82	83	84
196/330	Divoky, G.	Distribution, Abundance and Feeding Ecology of Birds Associated with Pack Ice Final Report April 1982								X		
217	Hansen, Donald	Langrangian Surface Current Measurements Final Report October 1978		X	X	X						
232	Lowry, Lloyd Burns, John	Trophic Relationships, Habitat Use and Winter Ecology of Ice-Inhabiting Phocid Seals and Functionally Related Marine Mammals in the Bering Sea Final Report 1982			X	X	X					
239	Myres, Timothy	Ecology and Behavior of Southern Hemisphere Shearwaters (Genus Puffinus) and Other Seabirds, when over the Outer Continental Shelf of the Bering Sea and Gulf of Alaska Final Report November 1982	X	X	X							
241	Schneider, Karl	Distribution and Abundance of Sea Otters in Southwestern Bristol Bay Final Report October 1982		X								
243	Calkins, D.G. Pitcher, K.W.	Populaton Assessment, Ecology and Trophic Relationships of Steller Sea Lions in the Gulf of Alaska Final Report June 1982		X	X							
248	Burns, John Fay, Francis Shapiro, Lewis	The Relationships of Marine Mammal Distributions, Densities, and Activities to Sea Ice Conditions Final Report June 1980	X	X								
251	Kienle, Jurgen Pulpan, Hans	Seismic and Volcanic Risk Studies -- Western Gulf of Alaska Final Report August 1984							X	X		
257/258	Stringer, W. J.	Morphology of Beaufort, Chukchi and Bering Sea Nearshore Ice Condition by Means of Satellite and Aerial Remote Sensing Final Report September 1978			X	X	X					

RU	PI	TITLE	75	76	77	78	79	80	81	82	83	84
267/663	Belon, Albert Stringer, W. J.	Operation of an Alaskan Facility for Application of Remote Sensing Data to OCS Studies (See 257/258)			X	X	X	X	X	X		
275	Shaw, D. G.	Hydrocarbons: Natural Distribution and Dynamics on the Alaskan Outer Continental Shelf Final Report February 1981	X	X	X							
282/ 301	Feder, Howard	Summarization of Existing Literature and Unpublished Data on the Distribution, Abundance and Productivity of Benthic Organisms of the Gulf of Alaska and Bering Sea	X									
284	Smith, Ronald	Food and Feeding Relationships in the Benthic and Demersal Fishes of the Gulf of Alaska and the Bering Sea Final Report March 1978		X	X		X					
285	Morrow, James	Preparation of Illustrated Keys to Skeletal Remains and Otoliths of Forage Fishes - Gulf of Alaska and Bering Sea		X								
289	Royer, Thomas	Circulation and Water Masses in the Gulf of Alaska Final Report March 1981			X	X	X					
290/ 291	Hoskin, Charles	Benthos-Sedimentary Substrate Interactions Final Report April 1978			X	X						
305	McRoy, P.	Sublethal Effects - on Seagrass Photosynthesis Final Report March 1977		X								
307	Muench, Robin	Historical and Statistical Oceanographic Data Analysis and Ship of Opportunity Program		X								
332	McCain, Bruce	Determine the Incidence and Pathology of Marine Fish Diseases in the Gulf of Alaska, Bering Sea and Beaufort Sea Final Report January 1980	X									
337	Lensink, Cal Bartonek, James	Seasonal Distribution and Abundance of Marine Birds Final Report November 1982	X	X	X	X						

RU	PI	TITLE	75	76	77	78	79	80	81	82	83	84
338	Lensink, Cal Bartonek, James	Photographic Mapping of Seabird Colonies	X	X								
339	Lensink, Cal	Review and Analysis of Literature and Unpublished Data on Marine Birds Final Report December 1980		X								
340	Lensink, Cal Bartonek, James	Migration of Birds in Alaskan Marine Waters Subject to Influence by OCS Development Final Report May 1978		X								
341	Lensink, Cal Bartonek, James	Feeding Ecology and Trophic Relationships of Alaskan Marine Birds Final Report August 1983	X	X	X							
342	Lensink, Cal	Population Dynamics of Marine Birds Final Report January 1983	X	X								
343	Lensink, Cal Bartonek, James	Catalog of Seabird Colonies Final Report October 1978		X								
347	Searby, Harold Brower, William	Marine Climatology of the Gulf of Alaska and the Bering and Beaufort Seas Final Report 1977 (Vol. II)		X	X							
349	English, Tom	Alaska Marine Ichthyoplankton Key Final Report September 1976		X								
352	Meyers, Herb	Seismicity of the Beaufort Sea, Bering Sea and Gulf of Alaska		X								
353	Rogers, Donald Hartt, Allan	Description of the Present Status of Knowledge of the Distribution, Relative Abundance and Migratory Routes of Salmonids in the Gulf of Alaska North of 52N and West of 135W, and in the Bering Sea South of 60N and East of 175W Final Report November 1977		X								
367	Reynolds, Michael Walter, A. B.	Mesoscale Meteorology						X				

RU	PI	TITLE	75	76	77	78	79	80	81	82	83	84	85
380	Waldron, K. D. Favorite, F.	Ichthyoplankton of the Eastern Bering Sea Final Report April 1978			X								
426	Cooney, R.T.	Zooplankton and Micronekton Studies in the Bering/Chukchi Seas Final Report March 1978	X	X	X								
427	Alexander, Vera Cooney, R.T.	Ice-Edge Ecosystem Study: Primary Productivity, Nutrient Cycling, and Organic Matter Transport Final Report March 1979		X									
431	Sallenger, Asbury Ralph, John	Coastal processes of the Eastern Bering Sea Final Report May 1979		X									
435	Leendertse, Jan	Modeling of Tides and Circulation of the Bering Sea		X					X	X			
480	Kaplan, I. R. Venkatesen, M. I. Reed	Characterization of Organic Matter in Sediments from Gulf of Alaska, Bering and Beaufort Seas Final Report June 1981		X	X				X				
506	Robertson, D.	Major, Minor and Trace Element Analysis of Selected Bering Sea Sediment Samples by Instrumental Neutron Activation Analysis (INAA) Final Report November 1979		X		X							
549	Schumacher, James	Southeastern Bering Sea Oceanographic Processes Final Report June 1983						X	X	X			
556	Dean, Walter	Trace Metals in the Bottom Sediments of the Southern Bering Sea Final Report September 1978				X	X						
557	McLeod, W.	Quality Assurance Program for Trace Petroleum Component Analysis				X	X	X	X	X	X	X	X
579	Frohlich, C.	Offshore Alaska Seismic Measurement Program Final Report June 1982							X				
586	Biswas, N.	Compilation of a Homogeneous Earthquake Catalog for the Alaska-Aleutian Region Final Report September 1981						X	X				

RU	PI	TITLE	75	76	77	78	79	80	81	82	83	84	85
594	Baker, E.	Suspended Particulate Matter Distribution and Transport (NASTE) in the North Aleutian Shelf Area Final Report September 1982						X	X	X			
595	Griffiths, R.	Microbial Processes as Related to Transport in the North Aleutian Shelf and St. George Lease Areas (NASTE) Final Report September 1981							X				
596	Overland, J.	Regional Meteorology of the Southeast Bering Sea Final Report February 1984						X	X	X			
597	Payne, J.	Multivariate Experimental Analysis of Petroleum Weathering under Marine Conditions Final Report January 1984						X	X	X			
604	Martin, G.	Seafloor Geologic Hazards on the North Aleutian Shelf Final Report February 1983						X	X				
607	Van Baalen, C.	Biodegradation of Aromatic Compounds by High Latitude Phytoplankton Final Report April 1982							X				
609	Armstrong, D.	Distribution and Abundance of Decapod Larvae in the Southeastern Bering Sea with Emphasis on Commercial Species Final Report September 1982							X				
611	Fay, F.	Modern Populations, Migrations, Demography, Trophics, and Historical Status of the Pacific Walrus in Alaska Final Report September 1982							X	X			
612	Burns, J.	Biological Investigations of Beluga Whales in the Coastal Waters of Northern Alaska Final Report December 1983							X		X		
613	Burns, J.	Investigations of Marine Mammals in the Coastal Zone of Western Alaska During Summer and Autumn Final Report March 1983							X				

RU	PI	TITLE	75	76	77	78	79	80	81	82	83	84
614	Curl, H.	North Aleutian, St. George Transport Study - Central and Northern Bering Sea (NASTE)							X			
616	Anderson, B.	Bering Sea Marginal Ice Zone-T/S Analysis-Water Data 1980 Final Report January 1982							X			
619	Malins, D.	The Nature and Biological Effects of Weathered Petroleum Final Report December 1983								X	X	
620	Rice, S.	Lethal and Sublethal Effects of Petroleum Contamination on Postlarval Stages of King Crab Final Report December 1983								X	X	
621	Mofjeld, H.	Boundary Conditions and Verification for the Model of Circulation and Oil Spill Trajectories on the Eastern Bering Sea Shelf Final Report September 1983								X		
622	Leatherwood, S.	Aerial Surveys of Endangered Whales in Southern Bering and Gulf of Alaska Final Report June 1984								X		
623	Cimberg, R.	Ecological Characterization of Shallow Subtidal Habitats in the North Aleutian Shelf Final Report January 1984								X		
624	Pearson, W.	Feeding Ecology of Juvenile King and Tanner Crabs in the Southeastern Bering Sea Final Report March 1984								X	X	
628	Craighead, L.	Population Estimates and Temporal Trends of Pribilof Island Seabirds Final Report September 1982								X		
629	Evans, W.	Effects of Man-made Waterborne Noise on Behavior of Beluga Whales Final Report June 1983								X		
MMS	Mate, B.	Development of Satellite-Linked Methods of Large Cetacean Tagging and Tracking Capabilities in OCS Lease Areas							X	X	X	X

RU	PI	TITLE	75	76	77	78	79	80	81	82	83	84	85
MMS	Malme, C.I.	Investigations of the Potential Effects of Acoustic Stimuli Associated With Oil and Gas Exploration/Development on the Behavior of Migratory Gray Whales								X	X		
MMS	Mate, B.	Development of Large Cetacean Tagging and Tracking Capabilities in OCS Lease Areas - I Final Report May 1981					X	X					
MMS	Hobbs, L. Goebel, M.	Development of Large Cetacean Tagging and Tracking Capabilities in OCS Lease Areas - II Final Report March 1981						X	X				
MMS	Watkins, W.	Effects of Whale Monitoring System Attachment Device in Whale Tissues Final Report January 1981						X					
MMS	Braithwaite, L.	Effects of Oil on the Feeding Mechanism of the Bowhead Whale - Baleen Fouling Final Report June 1983						X					
MMS	Reed, M.	Simulation Modeling of Effects of Oilspills on Fur Seals										X	
638	Armstrong, D.	Pribilof Island Crab Investigations									X		
639	McMurray, G.	Distribution of Red King Crab Larvae and Juveniles along the North Aleutian Shelf Final Report May 1984									X		
643	Laevastu, T.	Simulation Modeling of the Effects of Acute Oil Spills on Commercially Important Fisheries Resources in the Bering Sea									X	X	
645	Wilson, D.	Environmental Characterization of the North Aleutian Shelf Nearshore Region. Review of Literature. Final Report March 1984									X		
650	Karinen, J.	Effects of Oiled Sediments on Crab Reproduction									X	X	

RU	PI	TITLE	75	76	77	78	79	80	81	82	83	84	85
658	Truett, J.	Environmental Characterization and Biological Utilization of the North Aleutian Shelf Nearshore Zone										X	X
659	Houghton, J.	Seasonal Habitat Use by Inshore Species of Fish North of the Alaska Peninsula										X	X
661	Rice, S.	Lethal and Sublethal Effects of Spilled Oil on Herring Reproduction										X	
662	Fishman, P.	Lethal and Sublethal Effects of Oil on Food Organisms of the Bowhead Whale										X	
4014	(Planned)	Effects of Petroleum-Contaminated Waterways on Spawning Migration of Adult Pacific Salmon											X
MMS	Kana, T.	Coastline and Surf Zone Smear Model										X	X
MMS	Payne, J.	The Integration of Suspended Particulate Matter and Oil Transportation Study										X	X
MMS	Johnson, S.	Monitoring of Nesting Seabird Colonies in Alaskan OCS										X	
MMS	(Planned)	Monitoring of Seabird Colonies in Alaskan OCS Lease Areas											X

APPENDIX L

Commercial Fishing Industry

Tables and Figures

Prepared by

Minerals Management Service

Appendix L

Commercial Fishing Industry
Tables and Figures

The following tables and figures in this appendix provide information regarding the commercial fishing industry in the North Aleutian Basin.

Table L-1
North Aleutian Basin
Salmon Catch by Species, in Pounds

	1977	1978	1979	1980	1981	1982	6 Year Average
King							
Bristol Bay	2,989,045	4,577,782	4,534,195	1,881,902	4,542,235	5,186,532	3,951,949
Ak. Pen.	121,950	364,020	449,730	376,320	510,600	750,260	428,713
Total	3,110,995	4,941,782	4,983,325	2,258,222	5,052,835	5,936,792	4,380,662
Sockeye							
Bristol Bay	32,681,796	58,576,020	126,428,775	133,065,778	159,421,914	96,931,232	101,184,253
Ak. Pen.	5,056,320	8,617,010	17,721,470	25,830,930	23,678,150	21,605,870	17,084,950
Total	37,738,116	67,193,030	144,150,245	158,896,708	183,100,064	118,537,102	118,269,211
Coho							
Bristol Bay	836,277	707,033	2,296,312	2,249,388	2,004,269	4,841,543	2,187,470
Ak. Pen.	343,530	951,330	3,435,780	2,584,300	2,375,880	3,886,400	2,262,870
Total	1,179,807	1,658,363	5,732,092	5,023,688	4,380,149	8,727,943	4,450,340
Pink							
Bristol Bay	15,357	16,488,640	12,317	8,715,791	25,595	5,031,121	5,048,137
Ak. Pen.	5,797,820	20,703,020	23,655,950	26,472,410	18,169,560	22,268,220	19,511,163
Total	5,813,177	37,191,660	23,668,267	35,188,201	18,195,155	27,299,341	24,559,300
Chum							
Bristol Bay	10,388,066	8,222,439	5,984,860	8,196,464	10,032,088	6,971,954	8,299,312
Ak. Pen.	2,758,020	5,277,540	3,926,670	13,759,140	17,551,080	18,712,810	10,330,877
Total	13,146,086	13,499,979	9,911,530	21,955,604	27,583,168	25,684,764	18,630,189
All Salmon							
Bristol Bay	46,910,541	88,571,914	139,256,459	154,299,323	176,026,101	118,962,382	120,671,121
Ak. Pen.	14,077,640	35,912,920	49,189,000	69,023,100	62,285,270	67,223,560	49,618,581
Total	60,988,181	124,484,834	188,445,459	223,322,423	238,311,371	186,185,942	170,289,702

Sources: ADF&G Bristol Bay and Alaska Peninsula Annual Management Reports, 1982.

Table L-2
North Aleutian Basin
Ex-Vessel Value by Species in Millions of Dollars

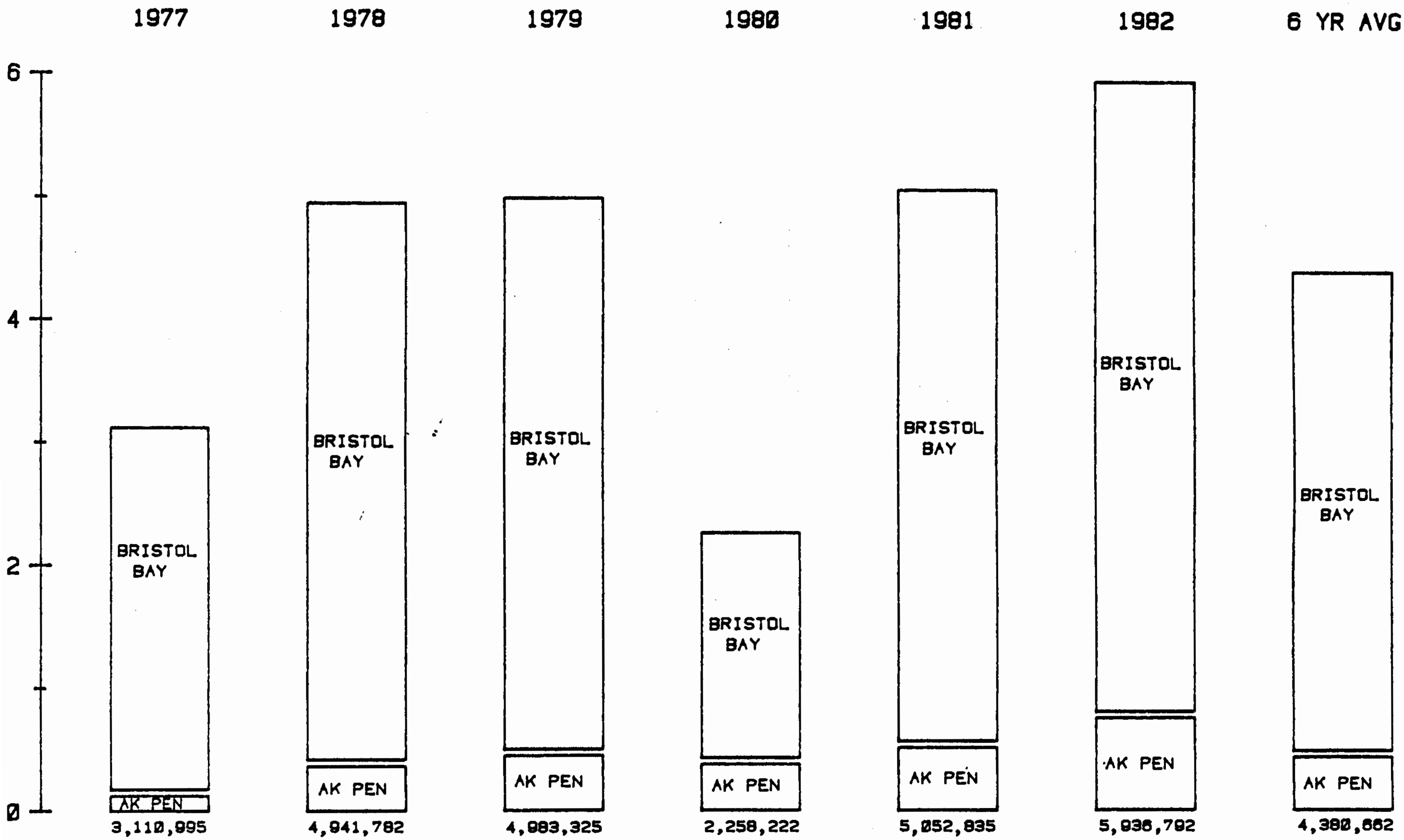
	1977	1978	1979	1980[a/]	1981[a/]	1982[a/]	6 Year Average
King							
Bristol Bay	$1,940,000	$3,206,000	$4,541,000	$1,881,000	$5,599,000	$6,356,000	$3,920,000
Ak. Pen.	63,000	275,000	516,000	455,000	735,000	893,000	490,000
Total	$2,003,000	$3,481,000	$5,057,000	$2,336,000	$6,334,000	$7,249,000	$4,410,000
Sockeye							
Bristol Bay	$19,434,000	$40,034,000	$128,992,000	$76,118,000	$121,399,000	$68,308,000	$75,714,000
Ak. Pen.	3,339,000	6,595,000	20,660,000	10,074,000	21,074,000	18,797,000	13,423,000
Total	$22,773,000	$46,629,000	$149,652,000	$86,192,000	$142,473,000	$87,105,000	$89,137,000
Coho							
Bristol Bay	$445,000	$435,000	$2,387,000	$1,392,000	$1,458,000	$3,423,000	$1,590,000
Ak. Pen.	197,000	631,000	3,544,000	1,240,000	1,687,000	2,798,000	1,683,000
Total	$642,000	$1,066,000	$5,931,000	$2,632,000	$3,145,000	$6,221,000	$3,273,000
Pink							
Bristol Bay	$50,000	$5,424,000	$5,000	$2,173,000	$8,000	$1,071,000	$1,455,000
Ak. Pen.	1,140,000	6,400,000	9,020,000	7,942,000	8,358,000	3,340,000	6,033,000
Total	$1,190,000	$11,824,000	$9,025,000	$10,115,000	$8,366,000	$4,411,000	$7,488,000
Chum							
Bristol Bay	$4,275,000	$3,173,000	$2,480,000	$2,738,000	$4,027,000	$2,192,000	$3,147,000
Ak. Pen.	1,162,000	2,590,000	1,815,000	4,953,000	7,898,000	8,421,000	4,473,000
Total	$5,437,000	$5,763,000	$4,295,000	$7,691,000	$11,925,000	$10,613,000	$7,620,000
All Salmon							
Bristol Bay	$26,144,000	$52,272,000	$138,405,000	$84,302,000	$132,491,000	$81,350,000	$85,826,000
Ak. Pen.	5,901,000	16,491,000	35,555,000	24,664,000	39,752,000	34,249,000	26,102,000
Total	$32,045,000	$68,763,000	$173,960,000	$108,966,000	$172,243,000	$115,599,000	$111,928,000

Sources: Technical Report #71; ADF&G Bristol Bay and Alaska Peninsula Annual Management Reports, 1982; CFEC, 1983.

a/ Ex-vessel values estimated for 1980-82 for Alaska Peninsula based on average weights by species and weighted average prices for purse seine, drift and set net gear.

Figure L-1

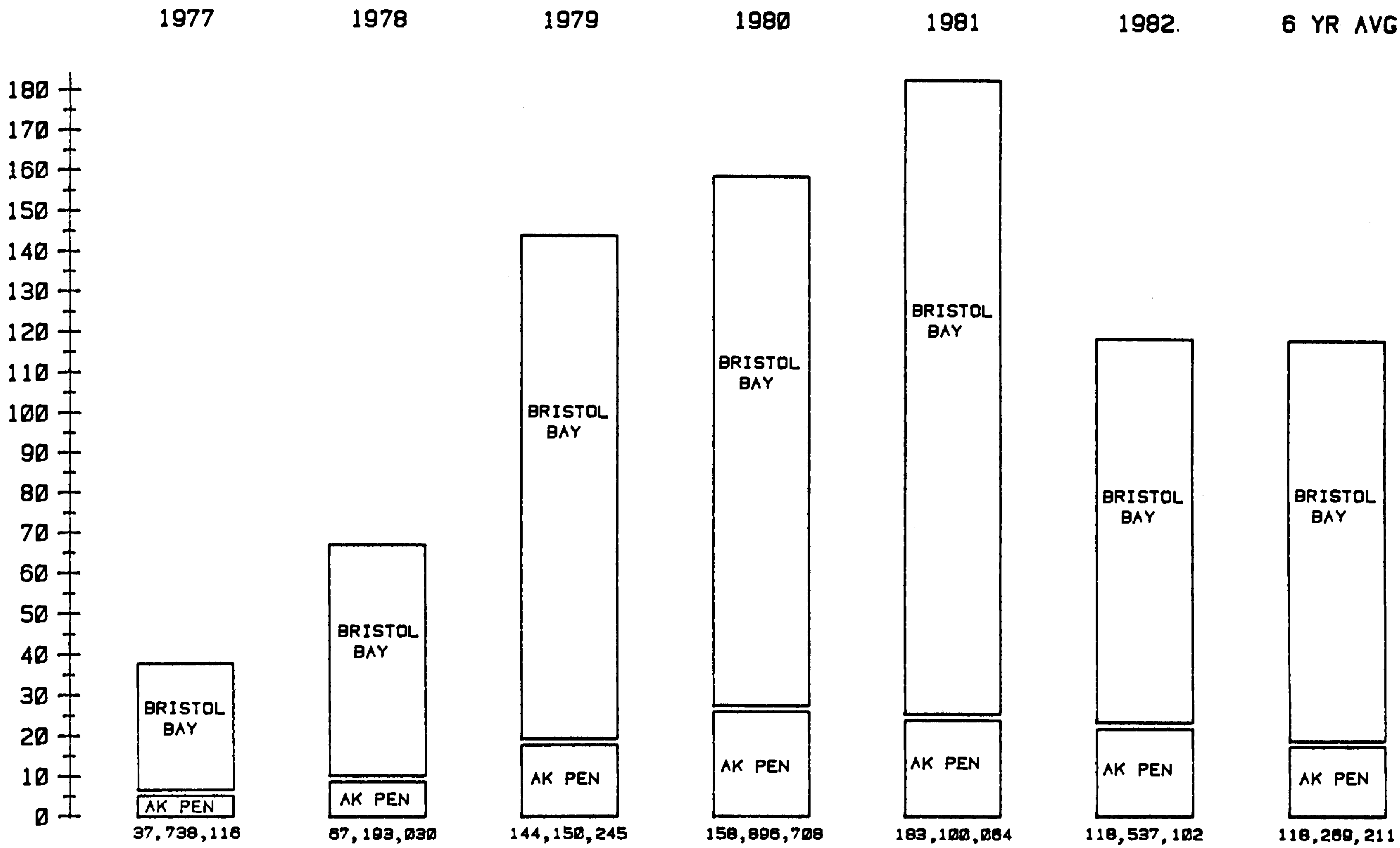
NORTH ALEUTIAN BASIN
KING SALMON
CATCH IN MILLIONS OF POUNDS



SOURCES: ADF&G BRISTOL BAY & ALASKA PENINSULA ANNUAL MANAGEMENT REPORTS, 1982

Figure L-2

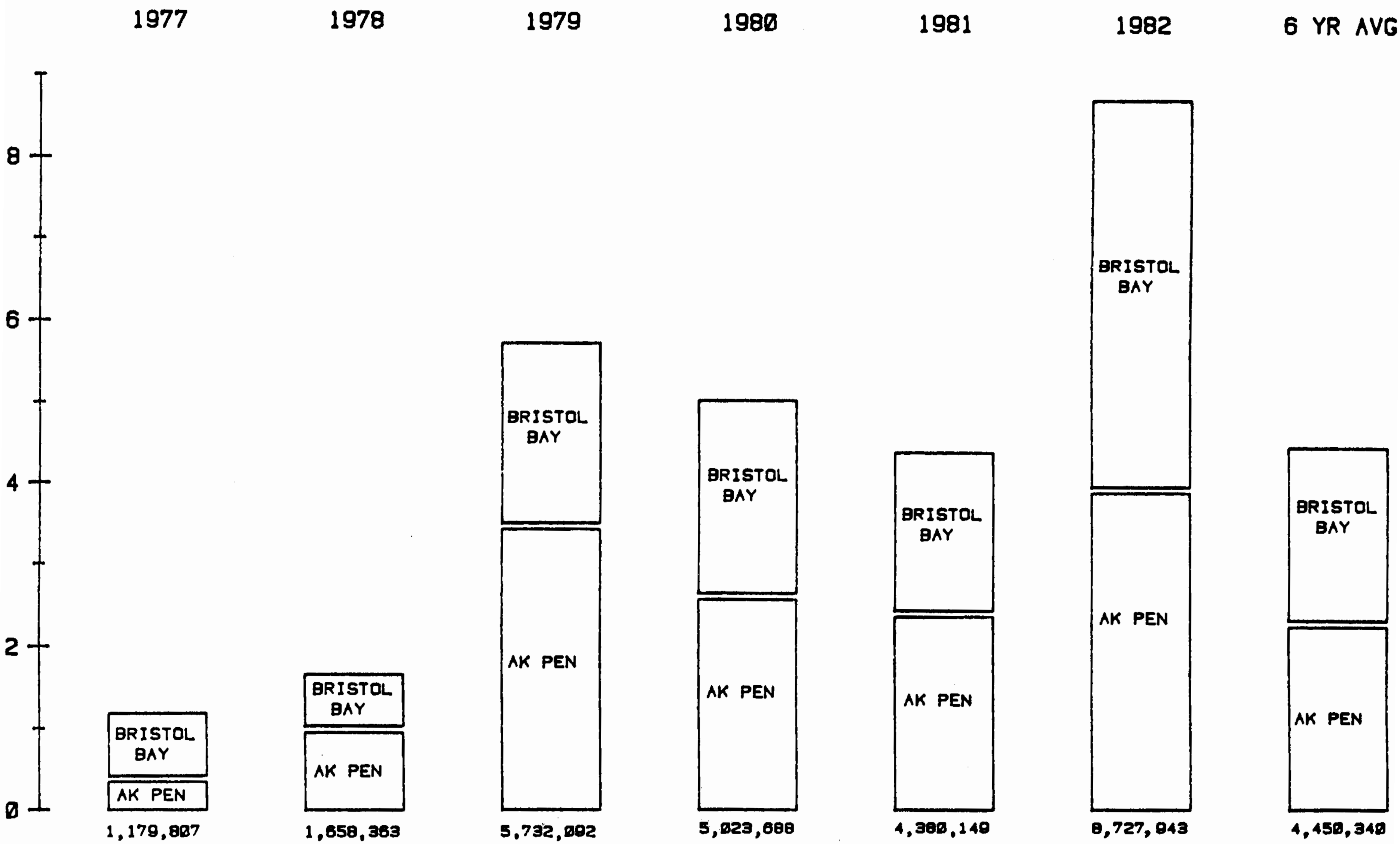
NORTH ALEUTIAN BASIN SOCKEYE SALMON CATCH IN MILLIONS OF POUNDS



SOURCES: ADF&G BRISTOL BAY & ALASKA PENINSULA ANNUAL MANAGEMENT REPORTS, 1982

Figure L-3

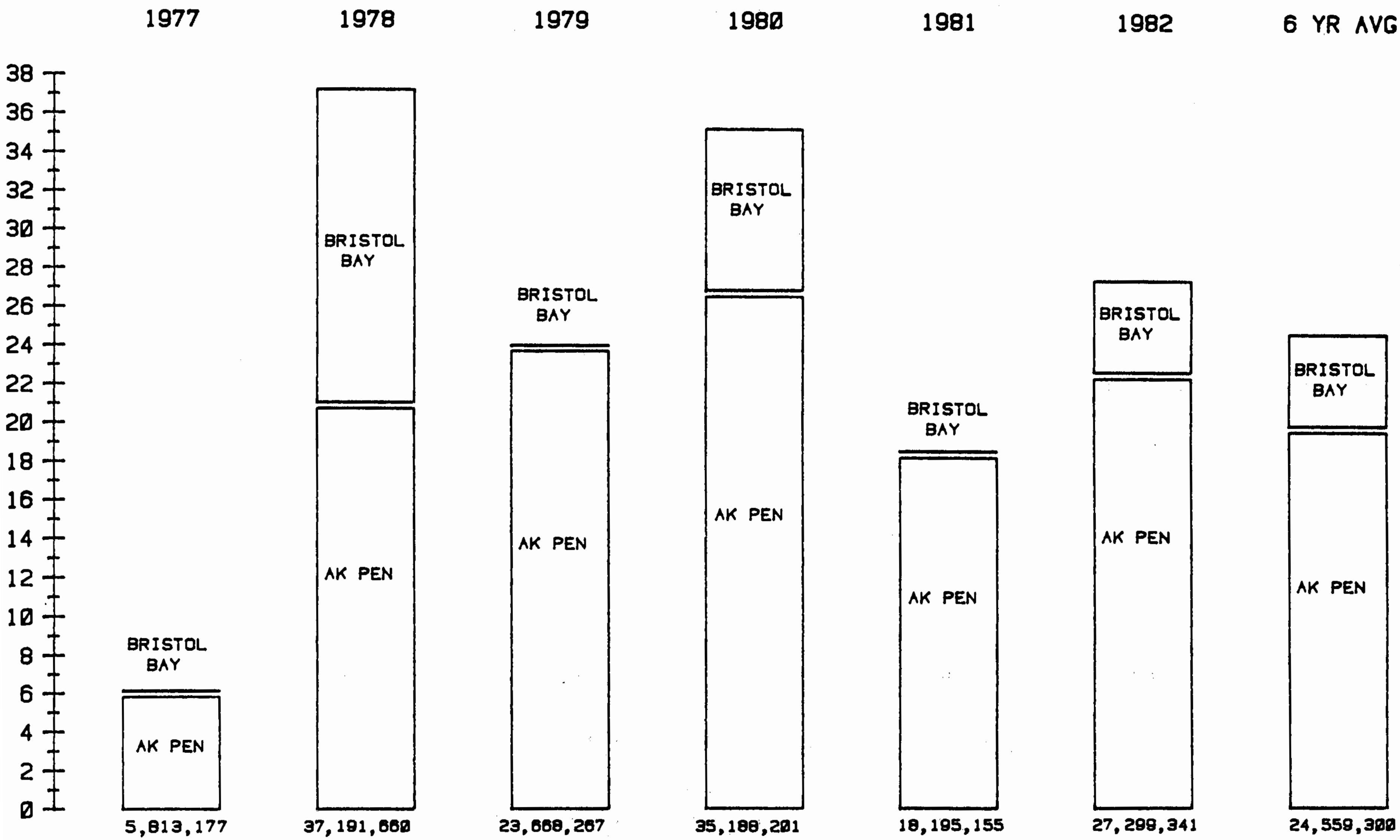
NORTH ALEUTIAN BASIN
COHO SALMON
CATCH IN MILLIONS OF POUNDS



SOURCES: ADF&G BRISTOL BAY & ALASKA PENINSULA ANNUAL MANAGEMENT REPORTS, 1982

Figure L-4

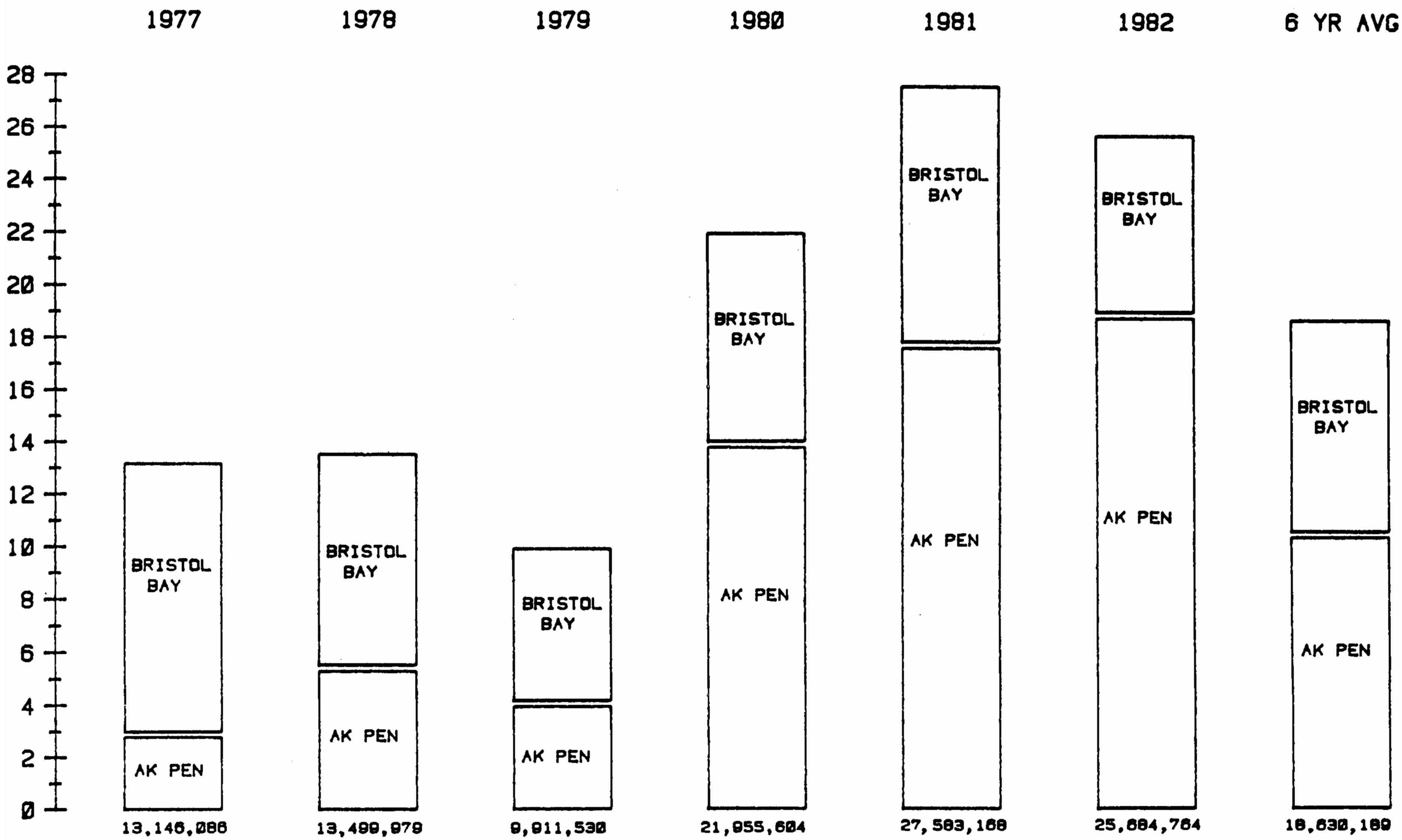
NORTH ALEUTIAN BASIN
PINK SALMON
CATCH IN MILLIONS OF POUNDS



SOURCES: ADF&G BRISTOL BAY & ALASKA PENINSULA ANNUAL MANAGEMENT REPORTS,1982

Figure L-5

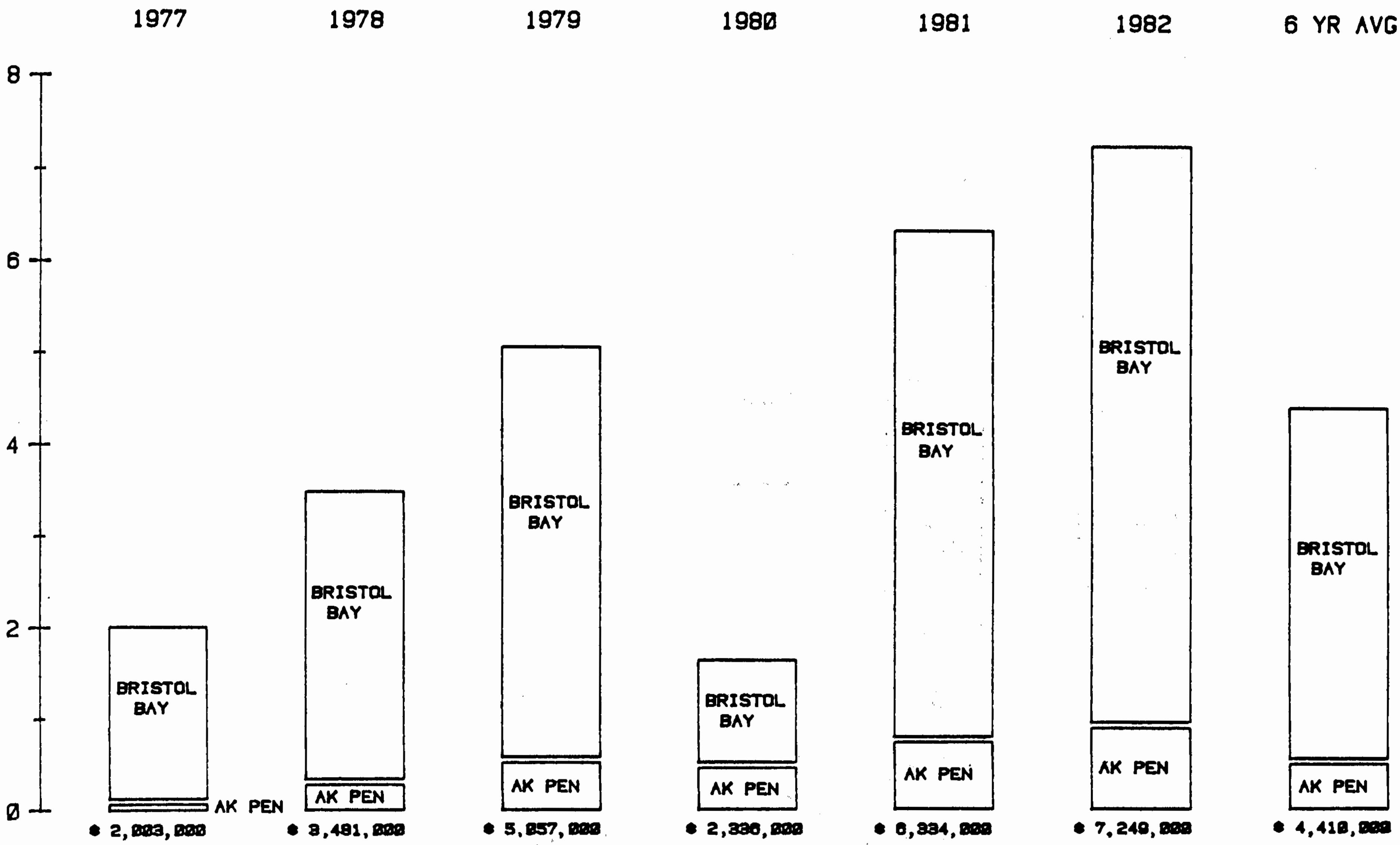
NORTH ALEUTIAN BASIN
CHUM SALMON
CATCH IN MILLIONS OF POUNDS



SOURCES: ADF&G BRISTOL BAY & ALASKA PENINSULA ANNUAL MANAGEMENT REPORTS,1982

Figure L-6

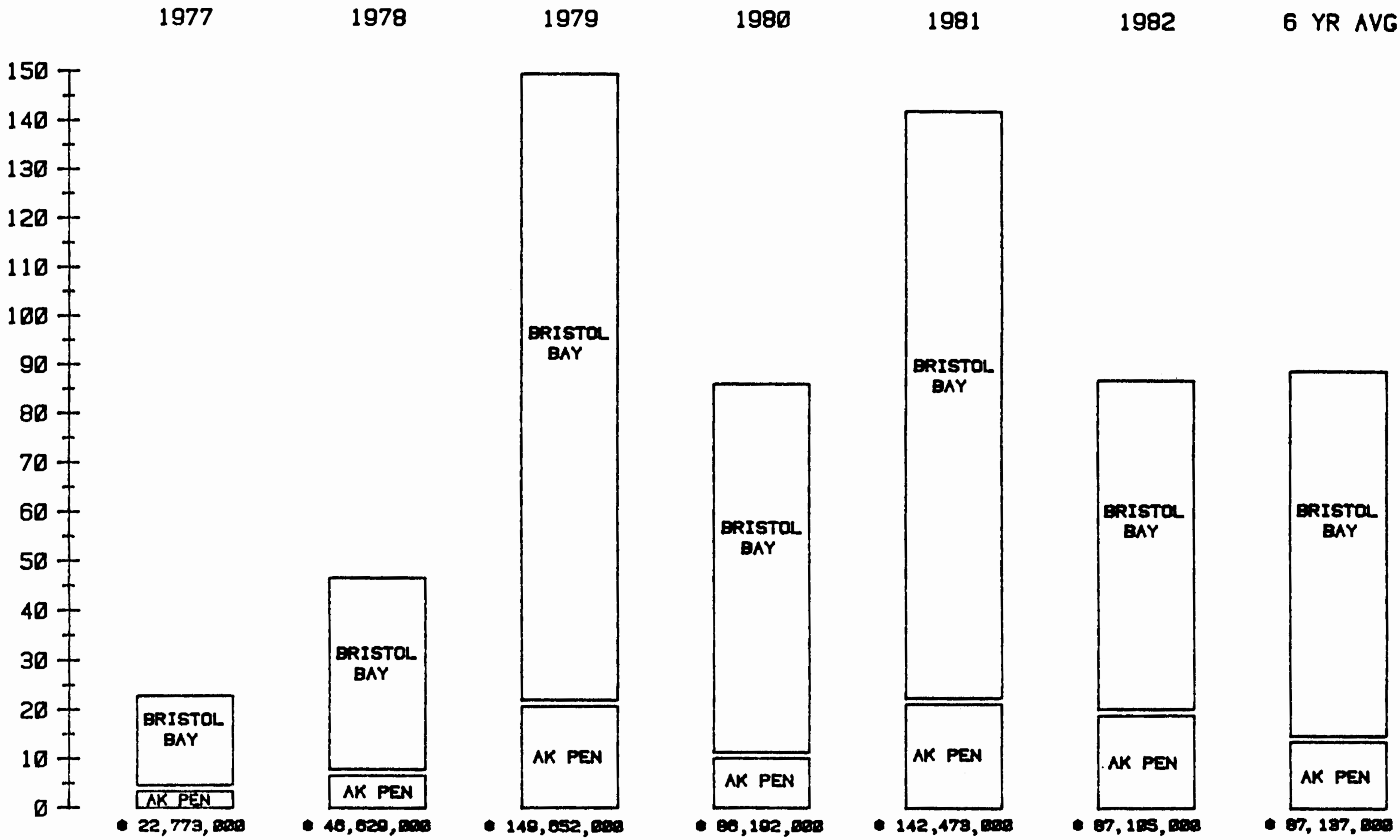
NORTH ALEUTIAN BASIN
KING SALMON
EX-VESSEL VALUE IN MILLIONS OF DOLLARS



EX-VESSEL VALUES ESTIMATED FOR 1980-82 FOR AK. PEN., BASED ON AVG WEIGHTS BY SPECIES & WEIGHTED AVG PRICES FOR PURSE SEINE, DRIFT AND SET NET GEAR.
SOURCES: COMBS, 1982; ADF&G BRISTOL BAY AND ALASKA PENINSULA ANNUAL MANAGEMENT REPORTS, 1982; CFEC, 1983

Figure L-7

NORTH ALEUTIAN BASIN
SOCKEYE SALMON
EX-VESSEL VALUE IN MILLIONS OF DOLLARS

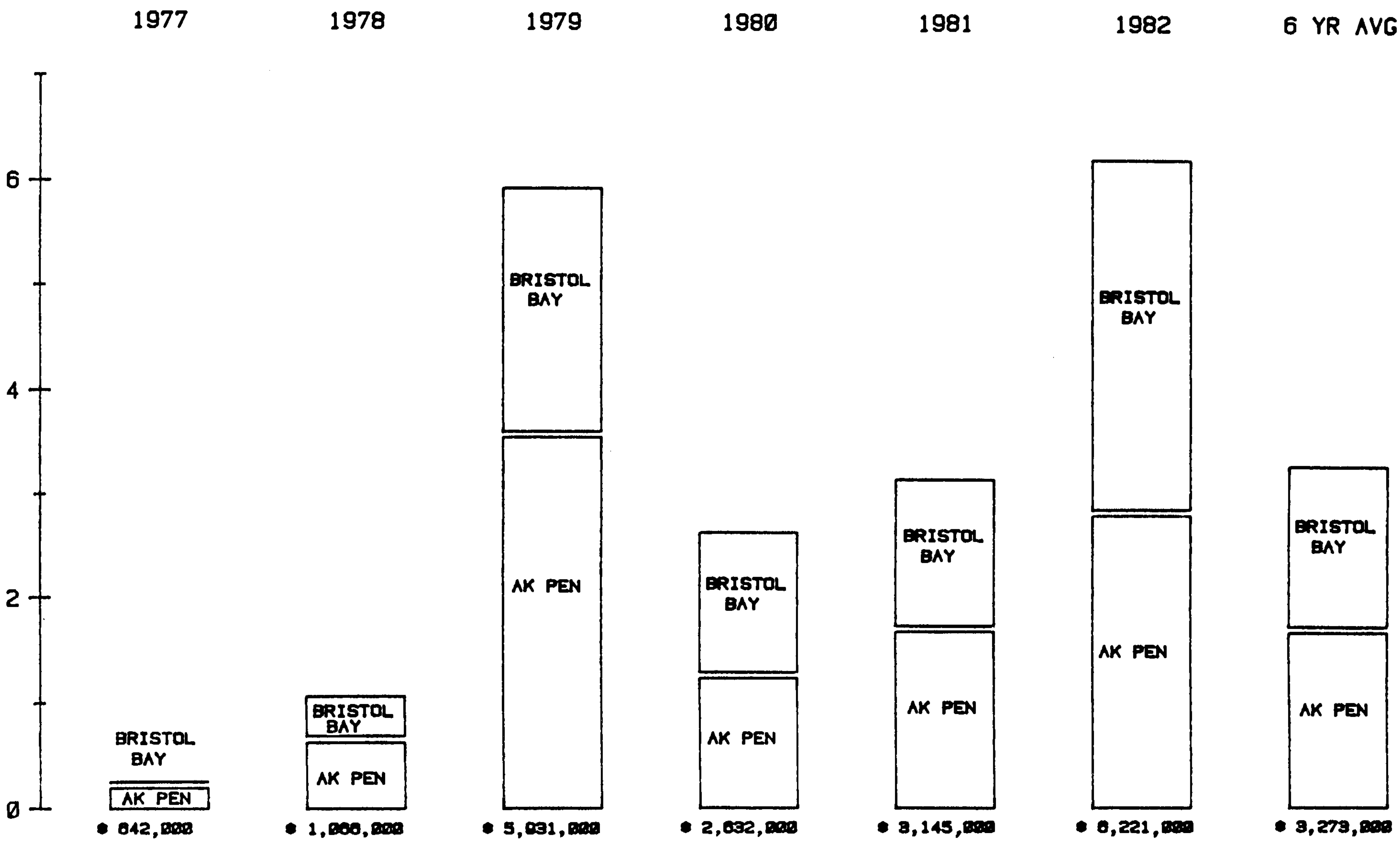


EX-VESSEL VALUES ESTIMATED FOR 1980-82 FOR AK. PEN., BASED ON AVG WEIGHTS BY SPECIES & WEIGHTED AVG PRICES FOR PURSE SEINE, DRIFT AND SET NET GEAR.

SOURCES: COMBS, 1982; ADF&G BRISTOL BAY AND ALASKA PENINSULA ANNUAL MANAGEMENT REPORTS, 1982; CFEC, 1983

Figure L-8

NORTH ALEUTIAN BASIN
COHO SALMON
EX-VESSEL VALUE IN MILLIONS OF DOLLARS

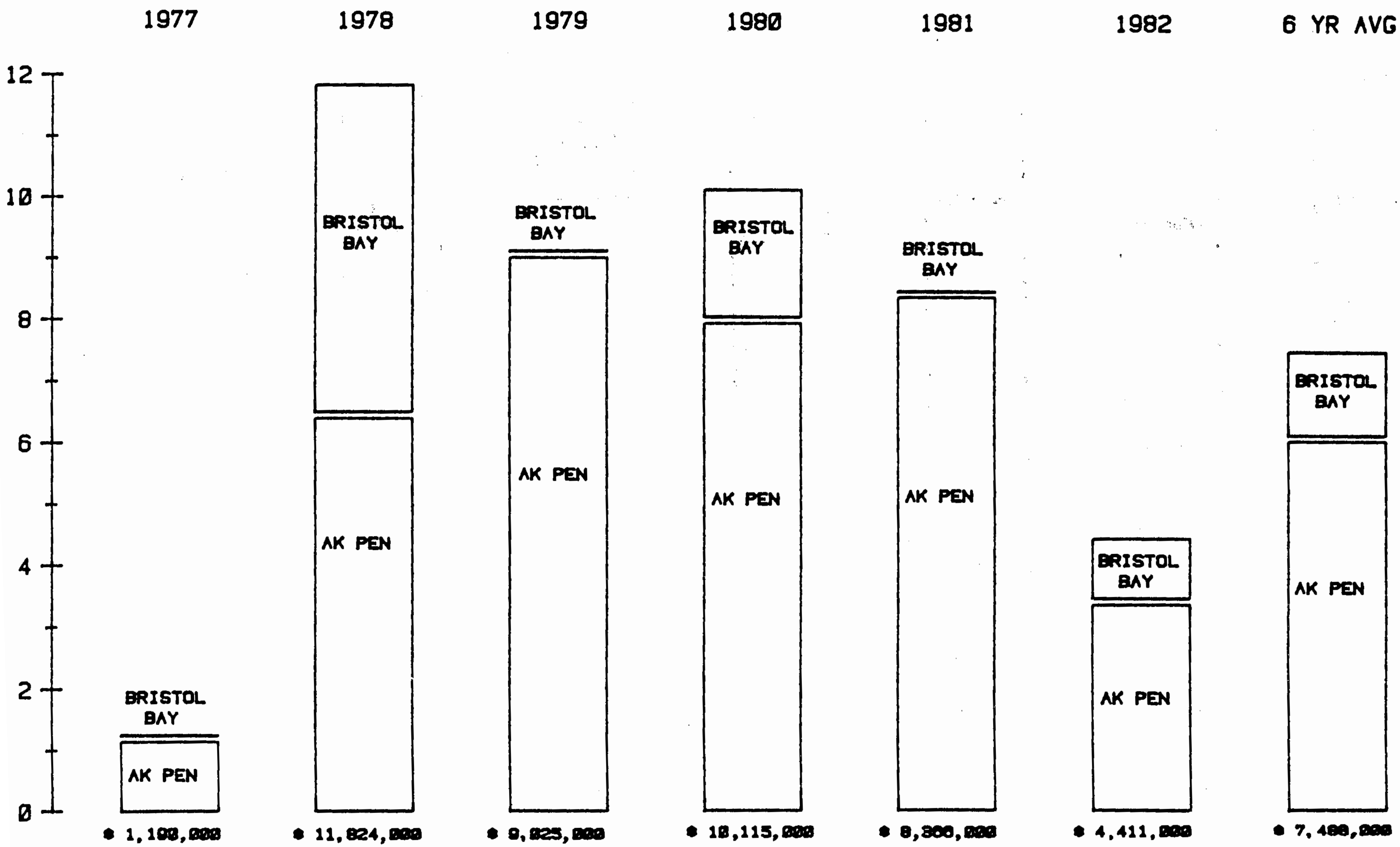


EX-VESSEL VALUES ESTIMATED FOR 1980-82 FOR AK. PEN., BASED ON AVG WEIGHTS BY SPECIES & WEIGHTED AVG PRICES FOR PURSE SEINE, DRIFT AND SET NET GEAR.

SOURCES: COMBS, 1982; ADF&G BRISTOL BAY AND ALASKA PENINSULA ANNUAL MANAGEMENT REPORTS, 1982; CFEC, 1983

Figure L-9

NORTH ALEUTIAN BASIN
PINK SALMON
EX-VESSEL VALUE IN MILLIONS OF DOLLARS

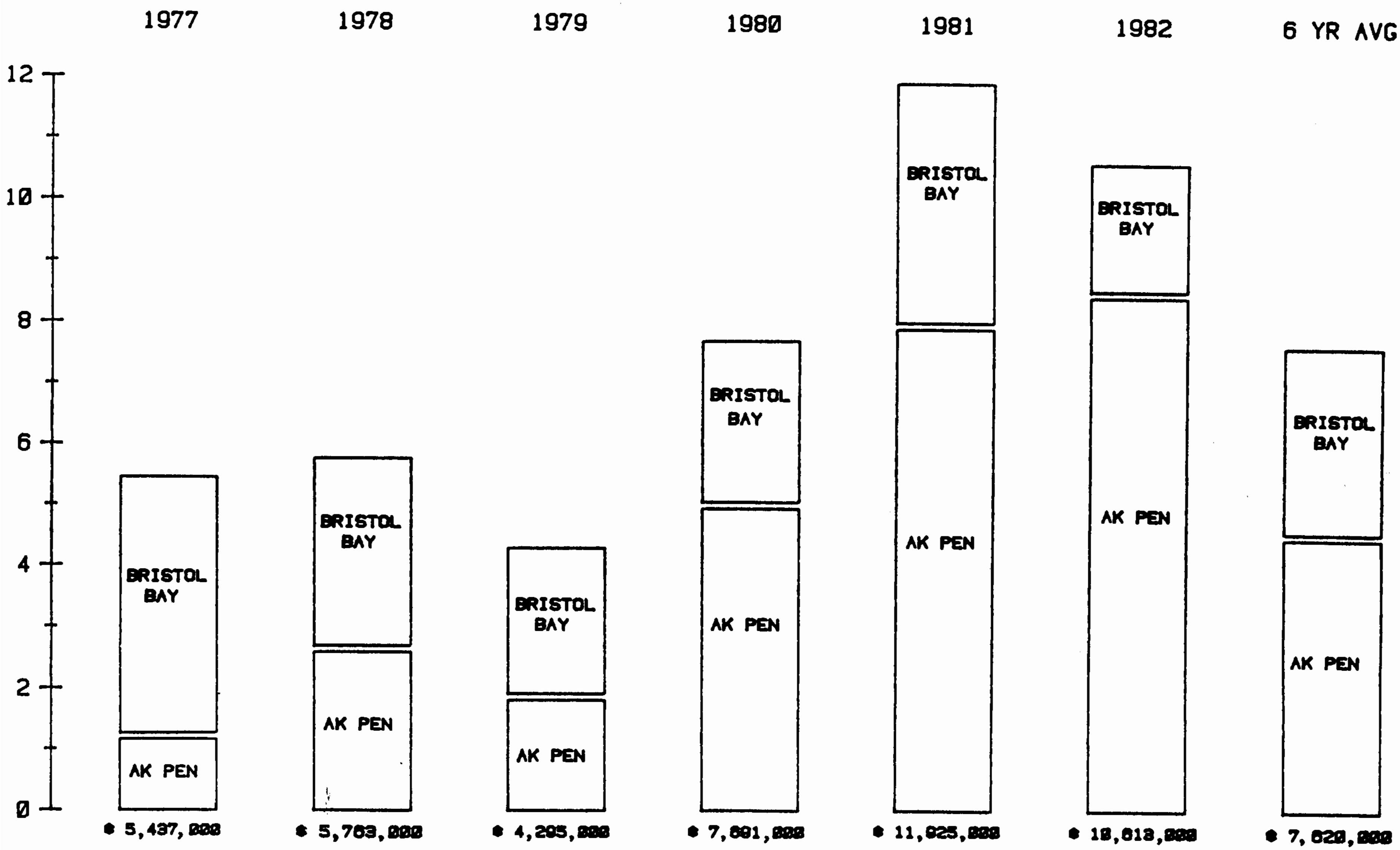


EX-VESSEL VALUES ESTIMATED FOR 1980-82 FOR AK. PEN., BASED ON AVG WEIGHTS BY SPECIES & WEIGHTED AVG PRICES FOR PURSE SEINE, DRIFT AND SET NET GEAR.

SOURCES: COMBS, 1982; ADF&G BRISTOL BAY AND ALASKA PENINSULA ANNUAL MANAGEMENT REPORTS, 1982; CFEC, 1983

Figure L-10

NORTH ALEUTIAN BASIN
CHUM SALMON
EX-VESSEL VALUE IN MILLIONS OF DOLLARS



EX-VESSEL VALUES ESTIMATED FOR 1980-82 FOR AK. PEN., BASED ON AVG WEIGHTS BY SPECIES & WEIGHTED AVG PRICES FOR PURSE SEINE, DRIFT AND SET NET GEAR.
SOURCES: COMBS, 1982; ADF&G BRISTOL BAY AND ALASKA PENINSULA ANNUAL MANAGEMENT REPORTS, 1982; CFEC, 1983

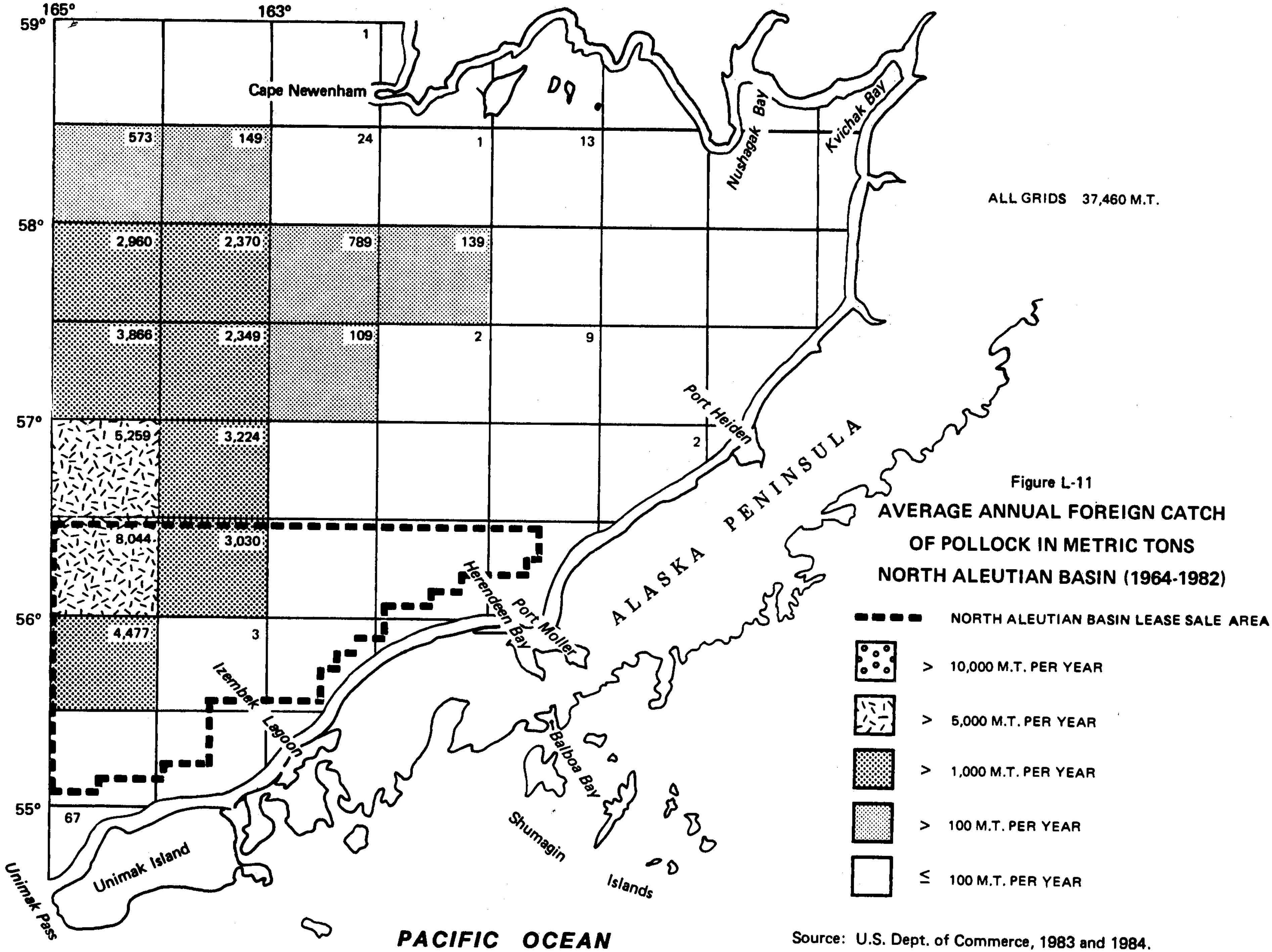


Figure L-11

AVERAGE ANNUAL FOREIGN CATCH OF POLLOCK IN METRIC TONS NORTH ALEUTIAN BASIN (1964-1982)

Source: U.S. Dept. of Commerce, 1983 and 1984.

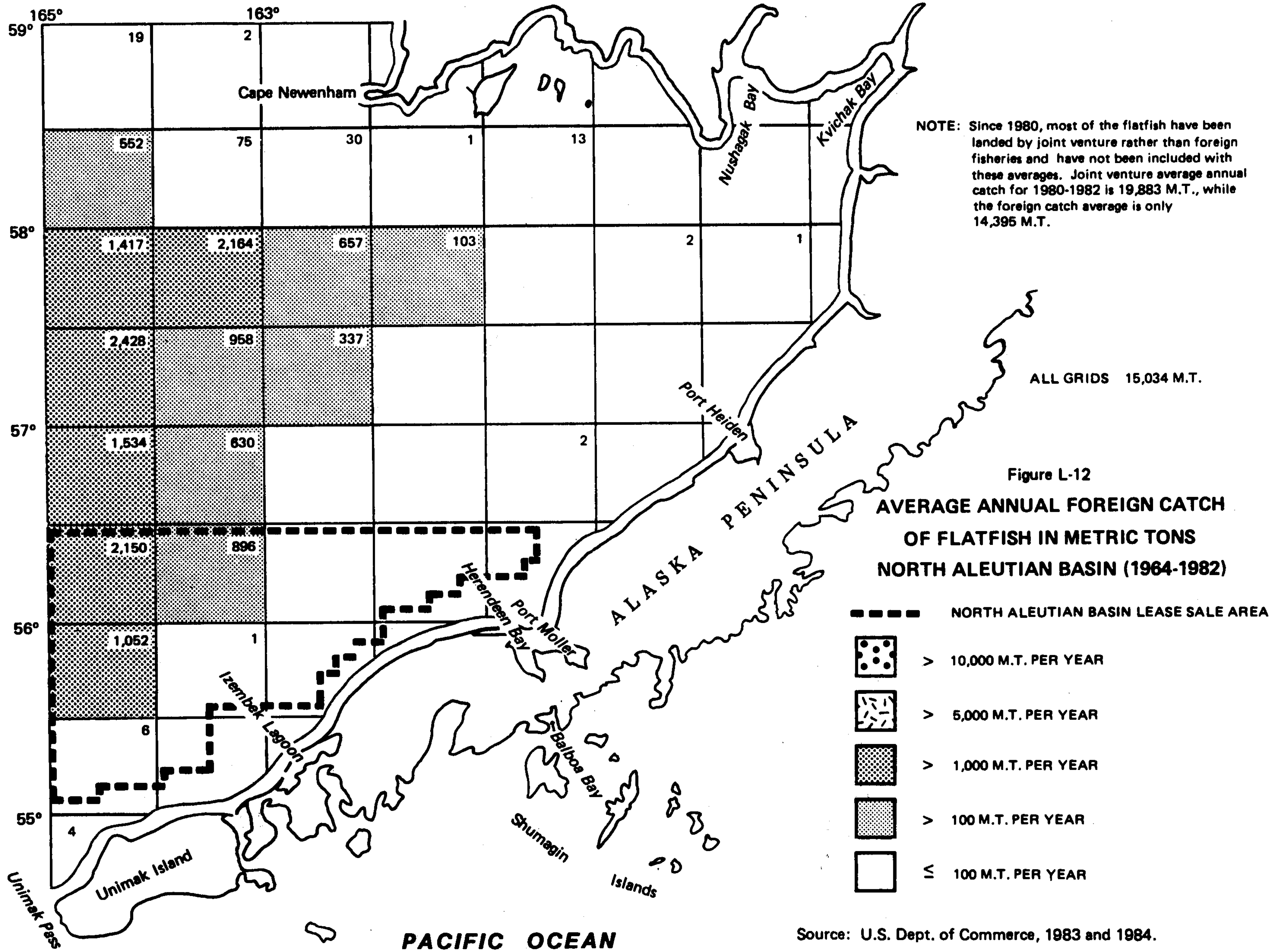
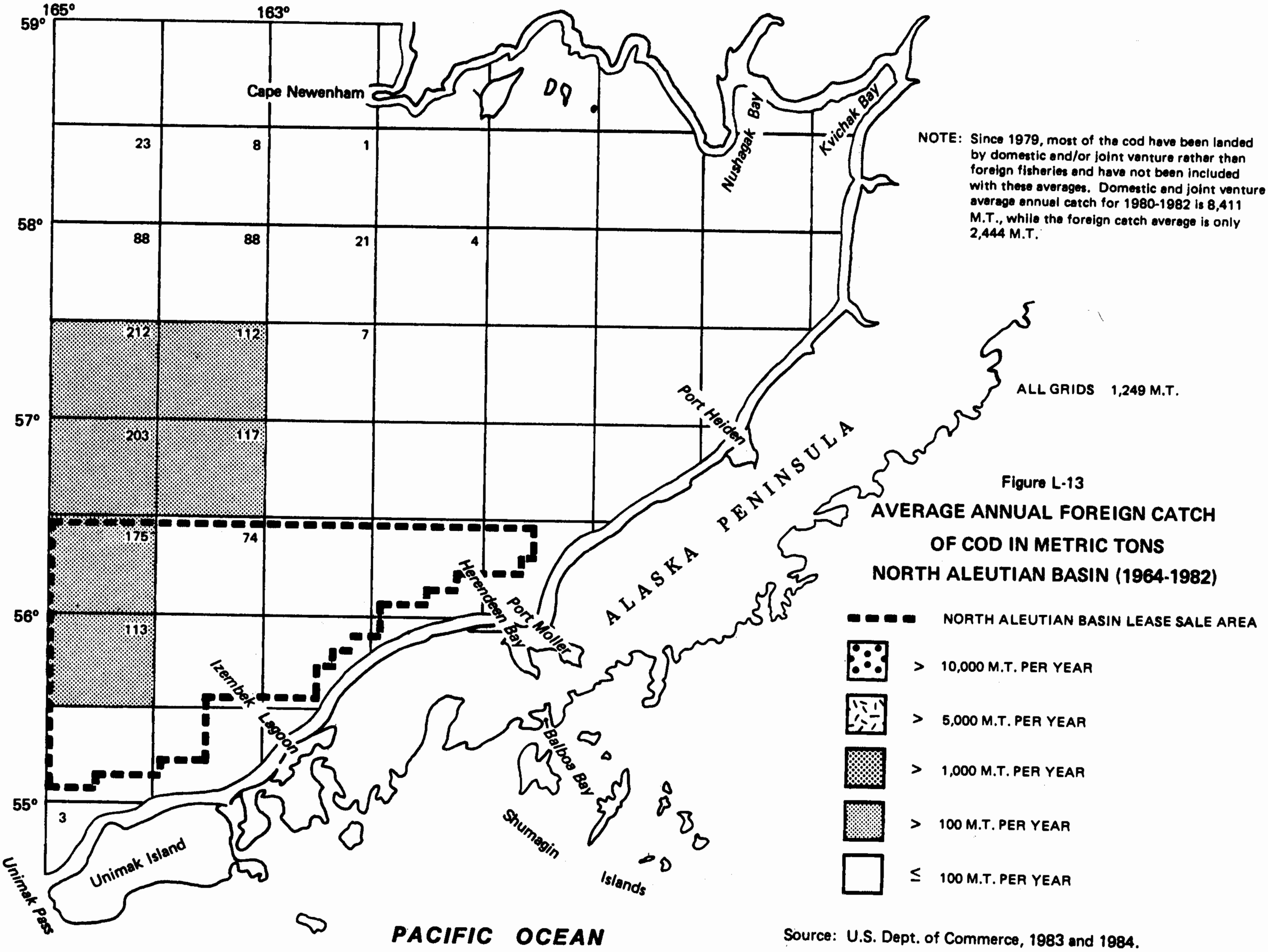


Figure L-12

AVERAGE ANNUAL FOREIGN CATCH OF FLATFISH IN METRIC TONS NORTH ALEUTIAN BASIN (1964-1982)

Source: U.S. Dept. of Commerce, 1983 and 1984.



NOTE: Since 1979, most of the cod have been landed by domestic and/or joint venture rather than foreign fisheries and have not been included with these averages. Domestic and joint venture average annual catch for 1980-1982 is 8,411 M.T., while the foreign catch average is only 2,444 M.T.

Figure L-13

AVERAGE ANNUAL FOREIGN CATCH OF COD IN METRIC TONS NORTH ALEUTIAN BASIN (1964-1982)

Source: U.S. Dept. of Commerce, 1983 and 1984.

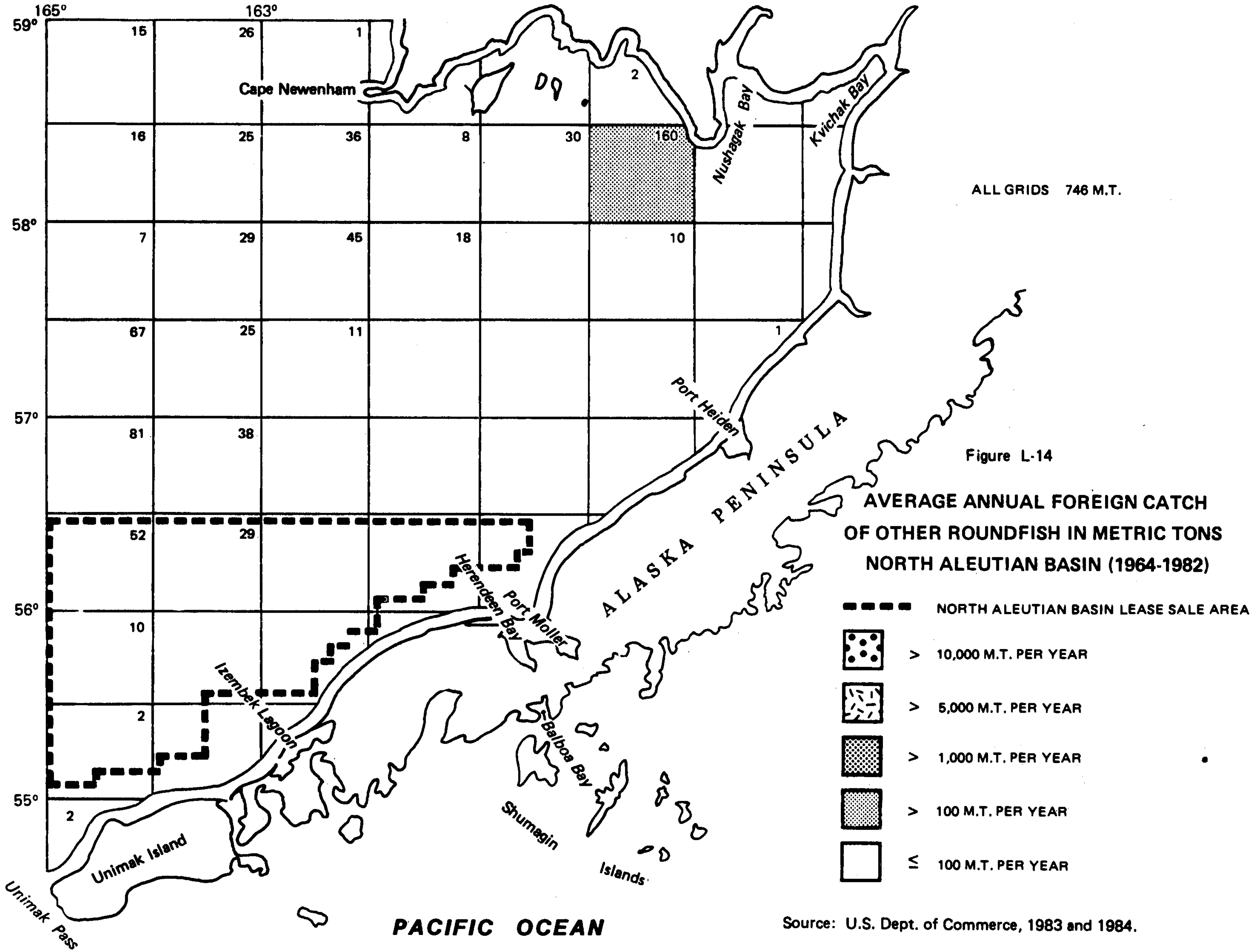


Figure L-14

AVERAGE ANNUAL FOREIGN CATCH OF OTHER ROUNDFISH IN METRIC TONS NORTH ALEUTIAN BASIN (1964-1982)

Source: U.S. Dept. of Commerce, 1983 and 1984.

APPENDIX M

Oil-Spill Response Equipment and Estimated Response Times for Mobilizing and Transporting Equipment to Dutch Harbor

Prepared by

Minerals Management Service

Appendix M

Oil-Spill Response Equipment and Estimated Response Times for Mobilizing and Transporting Equipment to Dutch Harbor

Table M-1
Alaska Clean Seas (ACS) Equipment at Dutch Harbor

CATEGORY: CONTAINMENT SYSTEMS

SUBCATEGORY: Open Ocean Boom

- Item: 1 each - 3,000-foot Whittaker Model 4300 Expandi Boom.

  Description: N/A

  Specifications:

Length:	50 feet/section
Weight:	177 pounds/section
Freeboard:	20 inches
Draft:	23 inches

  Support Equipment:
  1,000-foot pallet with all accessories required.
  Vacuum cleaner, wet/dry type.
  Vacuum valves.
  Injection valves.

  Limitations:

Minimum air temperature:	30°F
Maximum towing speed:	7 knots
Maximum swells:	5 feet
Maximum winds:	20 knots

SUBCATEGORY: Nearshore/Harbor Boom

- Item: 1 each - 3,000-foot Acme Corral Boom.

  Description:
  There are three packages (1,000 feet of boom in each package) stored on three trailers.

  Specifications:

Length:	200 feet/section
Weight:	1.96 pounds/foot
Freeboard:	8 inches
Draft:	12 inches

  Support Equipment:
  Tow bridles.
  Abrasion pad.
  3/4-ton towing vehicles.

  Limitations:

Maximum current:	3 knots
Maximum swells:	4 feet
Maximum towing:	12 knots (for locating deployed boom)
Minimum air temperature:	40°F

Table M-1
Alaska Clean Seas (ACS) Equipment at Dutch Harbor
(continued)

CATEGORY: RECOVERY SYSTEMS

SUBCATEGORY: Skimmers

- Item: 1 each - SOCK (Spilled Oil Containment Kit).

  Description:
  This open-ocean-oil skimmer will give good performance to 8-foot-wave heights, no performance degradation to 4-foot-wave height. Located on two 40-foot flatbed trailers. Operational performance has been demonstrated. Air transportable. Will recover oil up to 350 gallons per minute (gpm).

- Item: 1 each - Walosep W-1.

  Description:
  This is a baffle-weir skimmer with a diesel-hydraulically driven rotary-collection mechanism. Operational performance has been demonstrated over a wide range of viscosities in seas up to 9 feet. Recovery rates are up to 30 cubic meters per hour. Air transportable.

  Specifications:

Height:	27.5 inches
Width:	52.4 inches
Draft:	9.8 inches
Weight:	154 pounds

- Item: 2 each - Komara Miniskimmer.

  Description:
  This oleophilic disc skimmer is run by a diesel-powered-hydraulic motor; includes hose floats, clamps, hydraulic lines, and Petter diesel with built-in pump; high recovery efficiency (oil vs. water).

  Specifications:

Height:	18 inches
Width:	46 inches
Draft:	7.5 inches
Weight:	120 pounds
Maximum recovery rate:	10 tons crude per hour

  Support Equipment:
  Hydraulic power source, hoses, floats, connectors.
  Hipboots for deployment from shore.
  Vessel for offshore deployment.
  Spare discs and lines.
  Storage container for recovered oil.
  Diesel fuel for prime mover.

  Limitations:
  Maximum wave height: 2 feet
  Will handle some debris
  and emulsified oils.

- Item: 2 each - Acme Skimmer Model FS400ASIC-39TG-4.

  Description:
  Weir-type floating skimmer head.
  1.8 horsepower, 3,450 rpm gasoline engine.
  Adjustable weir.

  Specifications:

Diameter:	46 inches
Weight:	138 pounds
Recovery rate:	25 to 275 gpm
Discharge hose:	4-inch diameter

Support Equipment:
Hipboots for deployment from shore.
Vessel for offshore deployment.
Hose - minimum 10 feet to allow unit to float freely.
Hose floats and clamps (1 float/15-foot discharge hose; handtools).
Additional pump required if more than 30-foot discharge head.
Storage container with connectors for recovered product.
Fuel for gasoline engine.

Limitations:

Maximum effective discharge head:	30 feet
Minimum air temperature:	32°F
Minimum hose temperatures:	-5°F
Limited use in fast-flowing or rough water.	
Will not handle debris or heavy oils.	

SUBCATEGORY: Separators

° Item: 2 each - 200-barrel oil/water separator.

Description:
Mounted on 40-foot flatbed trailers.
For use with any collection system.
Tank-mounted on skids.
Drain valves.

Specifications:

Capacity:	200 pounds (8,400 gallons)
Fill openings:	2-inch, 4-inch, 6-inch

Support Equipment:
Trailer and crane for transporting and staging.
Hydraulic power pack.
Hose, kamlocks, valves, adapters, pump.
Extra gaskets, bolts, nipples.
Pipe wrenches.
Cable for lifting bridles.

CATEGORY: STORAGE SYSTEMS

° Item: 2 each - 100-pound holding and separator tank.

Description:
Tank-mounted on skids.
View port; hatch.
3 baffles.
Drain valves.
Shackle and sling bridle.

Specifications:

Capacity:	100 barrels (4,200 gallons)
Dimensions:	16 feet x 8 feet x 5 feet
Fill couplings:	2-inch, 4-inch, 6-inch
Weight:	12,000 pounds (empty)

Support Equipment:
Lowboy, tractor, and crane for transport and staging.
Hose, kamlocks, valves, adapters, pump.
Extra gaskets, bolts, nipples.
Pipe wrenches, kamlock tools.
Cable for lifting bridle.

Limitations:
For use on large vessels or land.

Table M-1
Alaska Clean Seas (ACS) Equipment at Dutch Harbor
(continued)

CATEGORY: TRANSFER SYSTEMS

- Item: 4 each - Gorman Rupp, 4-inch centrifugal pumps.

  Description:
  Lister diesel powered.
  Electric start.
  Kamlocked.
  Wash-down nozzles.

- Item: 1 each - hydraulic power pack for 200-pound oil/water separator pumps.

- Item: Hoses (all hoses kamlocked).
  10 each - 3-inch x 20-foot suction hose (200 feet).
  8 each - 3-inch x 50-foot discharge hose (400 feet).
  10 each - 4-inch x 20-foot suction hose (200 feet).
  8 each - 4-inch x 50-foot discharge hose (400 feet).

- Item: 3 each - Sludge Master 3 SMA3-A pump (air operated).

- Item: 2 each - Firestone Fabritank Model CFD-270.

  Description:
  Collapsible storage tank made of synthetic rubber-coated fabric.
  10 handles for positioning empty.

  Specifications:

Capacity:	25,000 gallons
Empty weight:	2,600 pounds
Flat dimensions:	34 feet, 4 inches x 27 feet
Fittings:	4-inch fill/discharge 2-inch air vent 2-inch bottom drain
Access ports:	2-fill/discharge cleanout ports

  Support Equipment:
  Forklift for moving crate.
  Support platform for filled tank.
  Dikes, impermeable liners, fire protection, as required.
  Adapters, kamlock fittings, dry-disconnect couplings.
  Hose and pumps.
  Torque wrench, extra bolts.

  Limitations:

Maximum capacity:	25,000 gallons
Maximum tank height:	63 inches (full)
Maximum fluid height in vent pipe:	½ inch (for product like diesel)
Minimum air temperature:	0°F
Onshore site:	Maximum 3 foot rise/100 feet
Do not clean tank with steam.	

- Item: 2 each - Dracone Dunlop Towable Bladder.

  Description:
  Towable, flexible storage container, nose-cone tow assembly and venting system. Three lengths 2-inch x 15-foot tow hose.

  Specifications:

Capacity:	2,500 gallons
Empty weight:	700 pounds
Dimensions packed:	6 feet x 5 feet x 4 feet
Dimensions filled:	3 feet x 45 feet

Table M-1
Alaska Clean Seas (ACS) Equipment at Dutch Harbor
(continued)

Support Equipment:
300-Foot tow rope rigging.
Lifting sling for filled container.
Tow vessel and pendant.
Connections and adapters for hoses to recovery devices and off-loading facilities.
Repair kit.
Cargo handling equipment to load/offload vessel.

Limitations:

Maximum towing speed:	12 knots
Maximum capacity:	2,500 gallons

CATEGORY: VESSELS

° Item: 2 each - Zodiac Mark V.

Specifications:

Length:	19 feet
Beam:	779 feet, 9 inches
Weight:	530 pounds in 2 packages
Motor:	1 each - 50 horsepower
	1 each - 85 horsepower

Support Equipment:
½-ton vehicle to pull trailer.
Fuel for motor.
Lines, paddles, and lifejackets.
Air pump and patch kit for leaks.

Limitations:

Maximum passenger capacity:	15
Maximum payload:	3,300 pounds
Will withstand rough water.	

° Item: 1 each - 2-man life raft.

CATEGORY: SORBENTS

° Item: 60 bales - 3M Type 270 boom
(5 - 8-inch x 8-inch boom/bales).
12 rolls 3M Type 100 rolls
(150 feet x 3 feet x 3/8 inch/roll).

CATEGORY: OIL-SPILL CHEMICALS

° Item: Dispersant, 10 drums - Exxon Corexit 9527 (55-gallon drums).

CATEGORY: CHEMICAL AGENTS DISPERSANT SYSTEMS

° Item: 3 each - hand-operated spray unit.

Description:
Application of chemicals in small areas.
4-gallon capacity.

Table M-1
Alaska Clean Seas (ACS) Equipment at Dutch Harbor
(continued)

CATEGORY: OIL-SPILL TRACKING SYSTEM

° Item: Orion Oil Spill Tracking System.

Description:
1 aircraft receiver.
1 vessel receiver.
10 tracking buoys.

CATEGORY: BIRD/MAMMAL PROTECTION

° Item: 20 each - "Scare-Away" Model M-Y Cannon.

Description:
Cannon fired by liquefied petroleum gas to keep birds and other mammals away from oil.

Specifications:
Steel construction.
Electronic ignition of liquefied petroleum gas.
Sound similar to 37-mm cannon.
Frequency of detonation variable.

Support Equipment:
Liquefied petroleum gas.
Floating support platform for water deployment.

Limitations:
Must be turned on once per day.

CATEGORY: COMMAND CENTERS

° Item: 1 each - 40-foot semi-trailer equipped to serve as a command center for oil-spill-cleanup operations. The van has a self-contained power plant, lighting, and heating system. The communication package used in the van is packaged so that it can be removed and used in a remote command center location. Listed below is a typical inventory for the van:

- Foul weather clothing/footwear for 12 people.
- Two MSA air packs (model #401, pressure demand).
- Two fire/flame protection suits.
- One resuscitator (MSA Portolator).
- Spare parts for small engines, pumps, and generators.
- Medical kit, and individual kits for 12 persons.
- 10 Imperial survival suits.
- Oxygen and masks for emergency medical use.
- Steam/hot water cleaning machine (Anchorage).
- Fire extinguishers.
- Cleaning materials and preservatives for equipment.
- Small refrigerator.
- Aluminum ladder.
- Warn electric winch.
- Rear-loading ramp.
- Four built-in bunks per van with blankets (8 total).
- Nylon line.
- Antenna for UHF frequency (454-459 MHz).
- Antenna for VHF marine band, and antenna for aviation band, citizen band.
- 40-foot van spare tires and rims.
- 12 tables, 24 chairs.
- 110-volt extension cords.
- Wind speed and direction indicator.
- Charts and display boards.
- Clock.

Table M-1
Alaska Clean Seas (ACS) Equipment at Dutch Harbor
(continued)

CATEGORY: COMMUNICATION SYSTEMS

- Item: 10 station telephone PBX system with 20 station intercom.
- Items: Mobile UHF-FM radio repeaters (100-watt); receives on 459 MHz; transmits on 454 MHz.
  Marine Band, VHF transceivers.
  Aviation Band, VHF transceivers.
  Citizen Band transceivers.
- Item: 1 each - base stations UHF antenna, mounted on the 40-foot Command Center vans, for use with repeaters or handheld MX-300 radios.
- Item: 1 each - Aviation Band 720 channels (7-watt), King KY-92 transceivers (118 MHz/136 MHz).
- Item: 12 each - UHF/FM handheld radios, Motorola MX-300; transmits on 459 MHz or 454 MHz; receives only on 454 MHz; battery-operated; located in Anchorage.

CATEGORY: MISCELLANEOUS EQUIPMENT

- Item: 20 each - boom lights
  Marker lights for Acme Corral Containment Boom.
  1 each - Herman Nelson BT-400-10 gasoline heaters 400,000 BTU capacity.
  1 each - air compressor, 150 psi, 200-volt single phase or gasoline engine with electric-start.
  2 each - portable lighting (explosion-proof) 100-watt lights with adjustable stands.
  2 each - Koehler 3-kilowatt generators - gasoline-powered.
  5 each - 40-foot flatbed trailer, selectively loaded with tanks, booms, and skimmers for fast response.
  1 each - MSA Gas/O^2 Alarm Mod 269.
  2 each - 40-foot storage vans.

Source: Marathon Oil Company, 1985.

Table M-2
On-Site Equipment Available on the Drilling Vessel
for Immediate Response to an Oil Spill at ARCO
Drill Site in Norton Sound, 1984

Equipment	Operational Capabilities
1,000 feet of 43-inch Expandi oil boom stored on a steel pallet	Works in waves up to 5 to 6 feet and winds up to 20 knots
1 Walosep W-1 skimmer complete with diesel hydraulic power unit and hoses, in steel-fiberglass storage box (storage box also serves as a 29-barrel capacity storage tank and oil/water separator)	Works in waves up to 10 feet
1 HIAB C-60 hydraulic crane, 22-foot reach for deploying skimmer (uses skimmer's hydraulic power unit)	
15 bales of 3M Type 156 oil sorbent pads (100 18-inch squares per bale)	For contained spills only
2 Kepner sea containers (1-1200 gallon, 1-600 gallon, each in metal storage box)	For contained spills only
2 hand sprayers- 4-gallon capacity	Within skimming capabilities
8 drums (440 gallons) chemical dispersant - ARCO-Chem D-609	Requires permission from federal on-scene coordinator for use
2 drums (55 gallons) chemical collectant - Exxon OC-5	Requires permission from federal on-scene coordinator for use
4 tanks (500 barrels) skid mounted (10 feet x 40 feet x 9 feet)1/	

Source: Hooks, McCloskey and Associates, Inc., 1984.

1/ Located at Unalaska shorebase.

Table M-3
Estimated Response Times for Mobilizing and Transporting Equipment to Dutch Harbor by Air Cargo Transport

EQUIPMENT OWNER	STORAGE LOCATION	ESTIMATED MOBILIZATION TIME[1/] (hours) (min)	(max)	TRANSPORTATION TIME TO DUTCH HARBOR[2/] (hours)	TOTAL RESPONSE TIME TO DUTCH HARBOR[3/] (hours) (min)	(max)
Alaska Clean Seas	Prudhoe	2	5	3.6	5.6	8.6
	Nome	2	5	2.3	4.3	7.3
	Anchorage	2	5	2.3	4.3	7.3
	Kenai	2	5	2.1	4.1	7.1
	Yakutat	2	5	3.2	5.2	8.2
	Dutch Harbor	2	5	0.0	2.0	5.0
Cook Inlet Response Organization	Kenai	2	5	2.1	4.1	7.1
U.S. Coast Guard	Kodiak	2	5	1.9	3.9	6.9
	Anchorage	2	5	2.3	4.3	7.3
Crowley Environmental Services	Anchorage	2	5	2.3	4.3	7.3
Alaska Offshore	Anchorage	4	-	2.3	6.3	-
Clean Sound	Seattle	2	5	7.0	9.0	12.0
Clean Bay	Concord	2	5	9.0	11.0	14.0
Clean Seas	Santa Barbara	2	5	11.8	13.8	16.8
Clean Coastal Waters	Long Beach	2	5	11.8	13.8	16.8
U.S. Navy	Stockton	2	5	9.0	11.0	14.0

1/ Estimated mobilization times were supplied by equipment owners and are overall ranges which are nonspecific to the type or quantity of equipment required.
2/ Estimated based on C-130 flight characteristics (300-knot flight speed).
3/ Total response times are the sum of estimated mobilization time and travel times by C-130 transport. They do not include the amount of time required to load the equipment or variations in travel time arising from adverse climatic factors which might be encountered enroute.

Source: Alaska Clean Seas, 1984.

Table M-4
Estimated Response Times for Mobilizing and Transporting Equipment to Dutch Harbor by Surface Vessel

EQUIPMENT OWNER	STORAGE LOCATION	ESTIMATED MOBILIZATION TIME[1/] (hours)		ESTIMATED TRAVEL TIME TO DUTCH HARBOR (10 knots)[2/]		TOTAL RESPONSE TIME (min)		TOTAL RESPONSE TIME (max)[3/]	
		(min)	(max)	(days)	(hours)	(days)	(hours)	(days)	(hours)
Alaska Clean Seas	Prudhoe	2	5	6	-	6	2	6	5
	Nome	2	5	2	16	2	18	2	21
	Anchorage	2	5	3	4	3	6	3	9
	Kenai	2	5	2	21	2	23	3	2
	Yakutat	2	5	4	1	4	3	4	6
	Dutch Harbor	2	5	-	-	-	-	-	-
Cook Inlet Response Organization	Kenai	2	5	2	21	2	23	3	2
U.S. Coast Guard	Kodiak	2	5	2	10	2	12	2	15
	Anchorage	2	5	3	4	3	6	3	9
Crowley Environmental Services	Anchorage	2	5	3	4	3	6	3	9
Alaska Offshore	Anchorage	2	5	3	4	3	6	3	9

1/ Estimated mobilization times were supplied by the equipment owners and are overall ranges which are non-specific to the type or quantity of equipment required.

2/ Travel times to site are from ports near storage site to Dutch Harbor. These estimates do not include the amount of time required to unload the equipment at the site or variations in travel time arising from adverse climatic factors which might be encountered enroute. Times are based on an average vessel speed of 10 knots.

3/ Total response times indicated are the sum of estimated mobilization times and travel times to the spill site.

Source: Alaska Clean Seas, 1984.

☆U.S. GOVERNMENT PRINTING OFFICE: 1985-461-432:21006