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.

V-1
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. Mismer Olson
   No response required.

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

6. Ms. Dorothy Flensburg*
   No response required.

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

8. Mr. Val Angassan
   No response required.

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

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

NAKNEK PUBLIC HEARING:

No speakers testified at this public hearing.

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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.

V-3
As indicated in Figure II-1, Unimak Pass and Isebek 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. Mr. Barbara Johnson (National Audubon Society)*
   No response required.

5. Mr. Peter Hanley (Soho Alaska Petroleum Company)*
   Soho 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 NOAA 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 1.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-8-1). One would consist of laying a pipeline from offshore platforms through Point Moller and Heresdeen 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 1 (Sec. IV.B.2. of the FEIS).

8. Mr. William Oussey (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 CBO)*
    The Aleutians East CBO comments are addressed in Response 4.

13. Mr. Jack Heaslip (Sierra Club)*
    The Sierra Club comments are addressed in Response 34.
All letters received during the DEIS comment period are reproduced in this section. Letters received from the Cities of Alegmark, Port Walden, 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 RMS.

A list of commentators follows.

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<td>2</td>
<td>State of Alaska, Department of Natural Resources, Division of Parks and outdoor Recreation</td>
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<td>3</td>
<td>Representative Adelheid Herrmann, Alaska State Legislature, House of Representatives</td>
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<td>4</td>
<td>Aleutians East Coastal Resource Service Area</td>
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<td>NPF Alaska Exploration, Inc.</td>
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<td>United Fishermen of Alaska</td>
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<td>Nelson Lagoon Village Council</td>
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<td>Walter J. Hickel</td>
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<td>26</td>
<td>Richard S. Russell</td>
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<td>27</td>
<td>Florence Collins</td>
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<td>U.S. Department of State</td>
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<td>35</td>
<td>U.S. Department of the Navy</td>
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* No response required.

V-6
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 II) presented in the draft EIS. Instead, we propose that Alternative II be revised to defer the lease sale until at least 1984.

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.

We are concerned that the marine environmental assessment data show that the existing oil spill cleanup capacity is not sufficient to meet the severe and life-threatening conditions identified by the State (Figure 1). Third, industry would have an opportunity to obtain operating experience in less sensitive and biologically productive areas of the Nation Sea prior to initiating operations in Bristol Bay. Fourth, this approach would provide additional time to improve oil spill prevention, 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 of deferring leasing in the nearshore waters within the three-mile limit until at least 1984.

Proposed Mitigating Measures

In addition to the above recommendations for delaying the sale until at least 1984, 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 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 discussed in Enclosures 1 through 6. Specific measures to be included in Enclosures 1 through 6 are: 1) Substantial reduction in the required amount of oil spill cleanup equipment required of lessees to meet the requirement of Alternative I of the public review of the draft EIS; 2) An increased amount of oil spill cleanup equipment required of lessees to meet the requirement of Alternative II of the public review of the draft EIS; 3) An increased amount of oil spill cleanup equipment required of lessees to meet the requirement of Alternative II of the public review of the draft EIS.

The proposed action of the DOI is consistent with the State's recommendation for oil spill cleanup measures as a mitigating action to environmental impacts from oil spills (e.g., pages 144C, 144D).
IV-G-1, etc. The draft EIS implies that the capability exists to effectively clean up oil under open-ocean conditions in the HAB. 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 HAB. The State has attempted to ameliorate the State's concerns by providing information that a reasonable and conservative approach for assessing environmental effects is to assume no cleanup, in the absence of evidence to the contrary, and that oil impacts are repeatedly addressed as mitigating factors in the draft EIS. This approach is inconsistent with DOI's stated assumption that it is likely to exceed both the public and federal decision makers, who may get the mistaken impression that oil spill containment measures eliminate "worst case" impacts. We believe the draft EIS is seriously flawed by its failure to provide adequate and consistent analysis in the HAB.

Description of the Affected Environment

While the draft EIS provides much needed information on the environmental and social features of the HAB, there are several notable deficiencies persistent to evaluating the lease sale programs of the HAB. These deficiencies appear to be based on the original sale area planning boundaries, which are larger than Sale 92 area. Further, some of the assessment are therefore confusing and incorrect. 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, we are unable to interpret the adequacy of environmental information to ensure a high level of confidence in the impact assessment. The assessment 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, a resource overview of these areas is contained in Conclusion 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, a resource overview of these areas is contained in Conclusion 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, a resource overview of these areas is contained in Conclusion 3. In addition, the draft EIS resource assessment covers an extremely large region and does not adequately focus on areas of primary biological concern.

As a result of the State's Information Needs Analysis for the HAB (Enclosure 11), a number of significant data gaps were identified which may seriously question the adequacy of the assessment of environmental impacts and effectiveness of mitigating measures contained in the draft EIS for Sale 92. The

Environmental Consequences of the Proposal

1-14

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

1-15

While the draft EIS 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 overall impact is 'moderate' or "minor."

Conservative estimates on the level of oil and gas exploration and development activities also set 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.

1-16

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 rather than maximum, oil production estimates; and do not provide additional risk estimates for areas currently projected pipelines. All of these factors may contribute to a lower calculated spill probability.

1-17

The oil spill impact assessments for open water areas, while needing some clarification, are reasonable estimates of biologically impacts due to soluble hydrocarbons fractions. These conclusions, however, may be questioned for nearshore and shoreline areas. The relative terms used to describe impacts, such as "moderate" and "minor," are acknowledged to be subjective and somewhat imprecise, some impacts could be termed " Cata Strophic" 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 Roller Resource Area, is presented in Enclosure 5.

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: 11 year conflicts with seismic operations, 11 trawl gear damage from oil development related obstructions and debris, 11 infrastructure and service-support conflicts; and 41 exploitation for labor.

Because of the economic and social importance of commercial fishing in the Sale A 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 HAB until at least 1994. In the event that NOI 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 acre is leased.

Sincerely,

Robert L. Gropper
Assistant Director

Enclosure

cc v/sec: Commissioners Vennick, DNR, Juneau
Commissioner Colliemorlorth. BPA, Juneau
Commissioner Ross, DEC, Juneau
Commissioner Butts, DOC, Juneau
Attorney General Gorasch, Juneau
State of Alaska
Bobbut McDonald, Office of the Governor
Teile Buttel, Bristol Bay CBA, Dillingham
Abby Arnold, Aleutians E. CBA, Anchorage
Cass Parsons, United Fishermen of Alaska, Juneau
Henry Gitchell, Boing Gas Fishermen's Assoc., Juneau
William Hopkins, ANGA, Anchorage
P.C. Melnik, ANG2 Alaska, Inc., Anchorage
R.M. Weaver, Exxon Company, U.K.A., Anchorage
G.W. Nelson, Ethio Alaska Petroleum Company, Anchorage
B.E. Bernard, Shell Oil Company, Anchorage
J.L. Weaver, Chevron, U.S.A., Inc., Anchorage
P.L. Seiler, Mobil, Denver
T.L. Bass, Texaco, Los Angeles
M.A. Smith, Texaco, Los Angeles
E.G. Malt, Phillips Petroleum, Anchorage
Licking See, GRG, New York

February 1985

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## 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-holding female king crab,
- potential for hydrocarbon contaminates 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 oil 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.\textsuperscript{2}

3. Potential effects of seismic operations on the commercial salmon fishery.\textsuperscript{1,2}

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.

\textsuperscript{1} Information needs currently being addressed by Outer Continental Shelf Environmental Assessment Program (OCSERP) studies.

2. Potential impacts of oil pollution on herring spawning substrates (eggs, larvae), including:
   - effects on the productivity of marine plants.
   - possible mortality of plants due to oil contamination.
   - effects on possible recolonization of previously used 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), including:
   - vulnerability of capelin spawning beaches.
   - incorporation of pollutants into beach substrates.
   - persistence of contaminants in substrates.

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.

e. 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.

\textsuperscript{-2-}
2.) Winter distribution and abundance of seabirds in the North Aleutian Shelf area.

3. MARINE HABITATS

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.

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

4. HABITATS

1.) Reactions 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.

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INTRODUCTION

The Alaska Department of Fish and Game (ADF&G) has produced this staff report on information needs pertinent to the North Aleutian Shelf area for the Minerals Management Service (MMS) in determining whether there is sufficient information to make a decision on whether to open the North Aleutian Shelf (NASC) oil field to oil and gas development. Although extensive environmental studies have been conducted in the southeastern Bering Sea and elsewhere, our review of the available information shows few studies have concentrated on the critical nearshore waters in and near the NASC. 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 populations, habitats, and harvest activities in the proposed lease sale area. Some of the information needs identified are also critical for assessing the adequacy 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 NASC is especially critical given the extremely important biological values of the region.

This report focuses only on the most significant information needs. Of 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 NASC. These data gaps do not comprise all the issues regarding oil and gas exploration and development in the NASC. They are simply those issues for which the department does not believe that the existing information is adequate to evaluate potential impacts, and for which the department believes that new information will significantly improve the impact assessment. The data gaps, identified by the department, are not necessarily the most important gaps in the region, but rather those data gaps that, if filled, will significantly improve the assessment of the potential impacts addressed in this paper. 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 habitats. 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, and 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, exploitation, production, and maintenance of offshore oil and gas facilities, and are estimated as a probability of 0.1% for each well. Disposal of oil spills is always a potential and major environmental threat due to the inherent possibility of adsorption of petroleum compounds and their adverse impact on the marine environment. The potential for major oil spills is always present, and adequate disposal procedures are necessary to minimize the impact on the environment.

The potential 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 seals, over a million northern fur seals, and nearly 20,000 sea otters that inhabit the area. In addition to the unique coastal areas, warmer on the northern side of the Alaska Peninsula, these species are especially vulnerable to oil contamination due to their reliance on marine habitat. Adversely, seabirds and marine mammals are also adversely affected by oil spill impacts. Certain marine organisms, such as those found in invertebrate beds, would also suffer severe impacts on waterfowl. The entire world population of Pacific black brant, emperor penguins, and Steller's eiders could be impacted if these coastal eelgrass beds were contaminated.

Oil spills can also significantly impact species such as fish, shellfish, and other invertebrates. Impacts can be through direct mortality or chronic sublethal effects. Many species of fish and invertebrates are particularly sensitive to petroleum contamination. This is especially true for species in the 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 Exxon Valdez oil spill in 1989. However, minor oil spills continue to occur, and open ocean containment and cleanup operations have been shown to reduce impacts. This is particularly true under adverse weather conditions and in severe sea states, which are common in the NAR. Consequently, adoption of all spill response measures is not likely to provide adequate protection of fish and wildlife should a major oil spill occur.

2. DRILLING MUD 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. The discharge of formation waters can introduce toxic substances such as hydrocarbons, heavy metals, and occasionally dioxin 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.

During the exploratory phase, these impacts are currently minimized through Environmental Protection Agency permit requirements; however, new drilling trends may increase these impacts. In 1990, for example, 65% of the oil drilled in the United States was drilled using new drilling muds. These activities place constraints on the number of use of muds and cuttings associated with field development. Although measures u-1 as of upland disposal of muds and cuttings could mitigate some offshore impacts, implementation of such measures is unlikely because of logistical 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 distribution and/or abundance. If the disturbed area is large in comparison to the total available habitat, or if the site located provides the only suitable habitat for a critical life stage, the impact to fish and wildlife could be severe.

Oil and gas activities 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
ten causes changes in nearshore circulation patterns and water quality, such as temperature, salinity, and wave energy. In addition, water pollution from hydrocarbons and other substances can have significant impacts on marine ecosystems, particularly in shallow areas such as intertidal zones.

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 vessel activity associated with offshore oil and gas exploration and development can cause varying degrees of disturbance to fish and wildlife. Noise, particularly from aircraft or by noise presence, may affect targeted habitats. The effect of such disturbance can be especially detrimental if it occurs during a critical period in a species' life cycle, such as hatching, staging, or spawning. Adverse effects can include direct mortality; altered behavior, such as increased feeding, shoaling, and group behavior; and behavioral patterns which, in turn, may lead to fertilization. However, seismic exploration, even with a typical non-explosive energy source, may cause substantial annoyance to schooling fish or marine mammals over a wide area.

Noise and disturbance impacts can be partially mitigated by using major facilities and traffic corridors away from fish and wildlife concentration areas. However, some level of noise and disturbance is probably inevitable, particularly in areas of high human activity. The effects of disturbance vary more dependably from one another. This is also true where impact sources are already located near sensitive areas, such as the Cook Inlet region near intertidal zones, or if geographically feasible, may be conducted in sensitive areas. In addition, the specific setback distances required to avoid disturbance to fish and wildlife have not been adequately documented for many species. Consequently, though some distance buffer zones are established, it is not currently possible to do so in many instances.

INFORMATION NEEDS

1. FISHERIES

4. King Crab

Introduction

The red king crab fishery of the southeastern Bering Sea has, in recent history, been the sickest fishery by U.S. fleet, with an estimated ex-vessel catch value of $18,300,000 in 1980 (Arms et al. 1981, Otsu et al. 1981). Populations from 1978 to 1980 were the highest in ten years (Otsu 1982). However, the commercial fishery suffered depressed landings as red king crab following the two preceding years and the fishery was closed in 1983. Marine water offshore of the western Alaska Peninsula (from Nikolski to Port Moller) extending northwest to the Pribilof Islands, which included the Bering Sea 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 Alaskan shelf were poorly described (Arms et al. 1981). The National Marine Fisheries Service (NMFS) has conducted broad-scale trawl surveys in the southeast Bering Sea for more than 12 years, and Otsu (1983) provides a history of information gathered by Japanese and Russian fleets. Little is known about the distribution of crab in shallow water, in waters exceeding 80 meters (m) in depth. They have reported 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. (1993) and McMurphy et al. (1994) 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 representative sites for the entire Bering Sea (Thorsteinson and Thorsteinson 1986). The highest densities (120-1000 m/sq m) of red king crab larvae were recorded in the proposed lease sale area (Thorsteinson et al. 1981). Larvae are very sensitive to water-soluble fractions of grilled oil, possibly affecting red king crab the most valuable species of economic value to oil and gas development in the Bering Sea (Thorsteinson and Thorsteinson 1986). 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 effect on this already stressed population.

Data Gaps
The reproductive success of king crab could be affected by the presence of hydrocarbons by eggs from bottom or interstitial waters where sediment hydrocarbons may be high (Kresse et al., 1983). The accumulation of naphthalene in contaminated waters by breeding eggs of the orange polychaete Nephtys armstrongi was documented by Nussel 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 in the area of brood." Additional analysis is 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 hydrocarbon upon developing eggs was shown by Tessen (1977), through exposing egg-bearing spawners to 1.46 milligrams/liter of water soluble hydrocarbon fractions for 72 hours. After one week, control females released an average of larvae each, while those exposed to oil released only 9 each. These effects of long term exposure and uptake of water soluble hydrocarbons were noted because the proposed lease sale area encompasses the Bellingham Bay site for red king crab in the Prince William Sound.

There is no significant information on the occurrence pattern of egg-bearing red king crab in the NWP. In the Puget Sound region, female king crab exhibit an annual onshore-offshore migration pattern (Powell and Hines 1982). However, given the limited knowledge of the eggs, this behavior is not well documented. It is suggested that the question whether females undergo an onshore-offshore migration and subsequently remain 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 interstitial water, where sediment hydrocarbon levels may be high by virtue of processes such as deposition of oil-laden sediments or storm mixing in shallow waters. Whether or not gravid females exhibit an onshore-offshore migration is important, since it affects the potential for increased hydrocarbon exposure periods, and the accumulation of hydrocarbon contaminants generally increases in nearshore environments. Since this is a primary area for deposition of discharged hydrocarbons, field surveys to document the 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 contamination to impair chemosensory organs. A female is listed as having an age of 9 years (Armstrong et al., 1987). After reproductive cycles are viable eggs to be produced (Armstrong et al., 1983). Sexually mature males locate females by strong pheromones, 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 McMurry et al. (1984) both stated that such an impact could occur. Chemosensory organs of the dusky crabs can detect water soluble hydrocarbons (Armstrong et al., 1987), a concentration well within the range of oil spill concentrations (Pearson et al., 1980). Following the Exxon Valdez spill, the numbers of gravid crab and lobsters were drastically reduced in 1986 and 1977 along the affected portion of the British coast (Foord and Calzador, 1992), 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.
Accurate knowledge of larval distribution along the North Atlantic shelf is critical to understanding potential oil and gas development impacts. Larval stages are the most vulnerable life stage, and oil pollution can lead to high larval mortality. The larval stages are known to exhibit vertical migration, which is influenced by environmental conditions such as temperature and light. Understanding these patterns is crucial for predicting potential impacts.

Recent studies on nearshore king crab larvae distribution have shown that larvae produce large numbers of larvae. Larvae are distributed based on data collected in 1977-1978, with the highest densities occurring in the Gulf of Maine. Larvae were found in areas with high planktonic productivity. Virtually all high density larval stations occurred in areas of ≤50 m, with the exception of the 150-200 m depth sampled in the study.

The study also noted that the highest density of larvae was found in waters deeper than 150 m. This suggests that larvae are capable of surviving in areas with low productivity.

Additional information is needed to determine the relative importance of nearshore areas as a habitat for young king crab. The hypothesis that has been presented states that nearshore areas are important because they provide protection from predators.

Michel et al. (1981) predicted that the availability of this nearshore habitat along the North Atlantic shelf is relatively rare. Sedimentary deposits in the area are primarily composed of silt and clay, which provide a suitable environment for larval development.

In conclusion, the importance of nearshore areas as a habitat for young king crab is significant. Further research is needed to fully understand the role of nearshore areas in the life cycle of king crab.
I. Additional information is needed to assess the potential impacts of oiled sediments 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 east side of the bay. Following an event of a major NWS oil spill, this area received a high density of hydrocarbon pollutants (NWS 1984). Hydrocarbon contamination could affect availability of preferred food sources, thus affecting crab growth and survival in local nearshore feeding and nursery grounds (NWS 1985). 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 presence of aromatic and naphthalene in Fairbanks, Alaska, sediments eight years after a spill of 7.2 million gal of oil. This persistence has also been observed in sediments of NWS 1984. In addition, Inatschok Island (Odelson and Teal 1975, Sanders et al. 1980). Additionally, in Arctic climes, the lighter and more toxic hydrocarbon fractions remain longer in the sediment than in temperate or tropical climates because of slower reaction rates (Atlas 1978).

Summary

Oil spills and discharges of formation waters or drilling mud, which could amount to several million gallons or several hundred thousand tons, respectively, could present a serious risk to the crab population. In order to determine quantitatively the risk, the following items must be obtained: 1) the potential for drift of hydrocarbon uptake by the crab, 2) the rate of biodegradation of the oil in marine environments, 3) the size and extent of the crab population in the spill area, 4) other environmental factors that affect the crab population, and 5) the impacts of these factors on the crab population. The impact of oil on the crab population can then be determined.

II. Additional information is needed to assess the potential impacts of oiled sediments on settling and recruitment of food organisms important to juvenile king crab.

A. Pacific Salmon

Introduction

Bristol Bay supports the largest sockeye salmon fishery in Alaska and in fact, the largest single sockeye salmon producing area in the world (NWS 1980). Large numbers of salmon smolts enter Bristol Bay from the Pacific Ocean. These smolts will only return to their natal stream, where they will spawn. These streams are generally small and do not have good spawning conditions. Salmon smolts are also harvested in Bristol Bay. Villagers from Sand Point to Goodnews Bay, as well as many other Alaska 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 $200,000,000 and employs over 10,000 people.

Approximately 80 percent of all salmon entering streams around the Bering Sea pass through North American Shelf waters (Menzies 1974). The origin of maturing salmon along the North American Shelf includes a mixture of western Alaska stocks from Kodiak Sound, Norton Sound, Yukon River, Kvichak Bay, and Bristol Bay (Baron, pers. comm.). The migration of Bristol Bay salmon stocks alone include over 60 million adult salmon and several hundred million outmigrating fry.

The impact of petroleum on the behavior and physiology of O. kisutch is not well understood. This is primarily because a large variety of petroleum sources are available as a source of petroleum. Different fish species, 2) the location of the spill, and 3) the toxicity of petroleum compounds to marine organisms. Several environmental factors that affect both the fish and the oil (Patterson 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.
Additional information is needed to adequately assess the potential impacts of oil spill events on the migration patterns of Pacific salmon in Alaska. A study to determine the levels of oil in the water and the effects of oil on salmon is currently underway.

Little research has been conducted on the marine migration patterns of Pacific salmon in Alaska. Only the sockeye salmon has been extensively studied. Information on the migration habits and movements of other salmon species is limited. However, scientists believe that the migration patterns of Pacific salmon in Alaska are still inadequately documented.

Seaward migration patterns of salmon can directly influence a species' vulnerability to oil contamination. The following characteristics of the seaward migration pattern, as identified by Swartz (1974), increases the potential for oil spills to be released at the time and place when salmon are most vulnerable:

1. The migration occurs during the day, which increases the chance of exposure to oil spills.
2. The migration is concentrated between the coast and 40 miles offshore along the north side of the Alaska Peninsula. If they are contained within the upper 10% of water at night and at a depth of 2 meters during the day, and if the various Bristol Bay stocks may become mixed and concentrated in nearshore waters during late summer. The individual migration behavior of the other juvenile salmon species may be the same as sockeye salmon.

Delineating the timing and migration of all juvenile salmon species is important to determine the effects of oil spill events on salmon populations. For example, pink salmon are generally believed to be exposed to oil spills during the years between 1973 and 1976. If this is true in Bristol Bay, pink salmon could be more vulnerable than sockeye salmon to oil contamination impacts. Additional information is needed to determine the precise dates that juvenile salmon stocks become mixed in outer Bristol Bay (between 1974 and 1975).
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 75 percent of pink 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 salmon would avoid toxic hydrocarbon concentrations resulting from a crude oil spill. In fact, Rice (1973) found that fry avoided hydrocarbon concentrations of 1.6 milliliters/100 ml and greater. However, this level is below what is considered acute toxic, such concentrations could result in substantial effects to juvenile salmon (Rice et al. 1979). 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 many species and the fact that many juveniles reside there until their ability to avoid toxic concentrations of hydrocarbon contaminants, additional information is needed. Under et al. (1981) showed that mature Pacific salmon migrating upstream during the peak of the run are substantially avoided by mature pink and coho salmon 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 with an alternative. This information is relevant because a large oil spill could result in deaths of important Bristol Bay salmon stocks. If adult salmon will not pass through such waters, significant spawning reductions could result within these streams.

The completion of additional research on these issues and an OCS study is scheduled to address this data gap stage. However, in the absence of definitive results, they will not be available until late 1986 or early 1987; after the Sale 92 planning process is complete.

1. 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.

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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 salmon populations appeared to cease migrating into Prince William Sound after the FPC oil spill. This observation could not be statistically verified through analysis of capture data (Kearns, 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 catches for several days following seismic operations (Maaro, pers. comm.). Because of the perceived potential for seismic operations to interfere with salmon migrations, additional studies need to be conducted to define the potential for seismic operations to disrupt normal fish behavior patterns.

The Pacific Region of NOS 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 as of February 1985. After these results are obtained, the study is not scheduled to be completed until late 1986 or early 1987; after the Sale 92 planning process is complete.

Summary

Oil and gas development in the NWS 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, the identification of potential migration corridors, 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 and, consequently, interfere with commercial salmon harvests. Due to the economic importance of the Bristol Bay salmon fishery, and the need for careful consideration, should be given to the compatibility of oil and gas development activities with this valuable renewable resource.

c. Pacific Herring

Introduction

The RAS and adjacent areas support several commercial fisheries for food and bait herring, as well as the herring: herring fisheries in Valdez, Sitka, and the Prince William Sound area; and the subsistence fisheries in Alaska. Herring are also important to the subsistence fisheries in the eastern Bering Sea, which provide a significant portion of the commercial fishery harvest. Herring are also important to the subsistence fisheries in the eastern Bering Sea, which provide a significant portion of the commercial fishery harvest.

Available data strongly suggest that there are mixed stocks of eastern Bering Sea herring. This is due to the fact that the surveys have been conducted in a variety of areas and that the mixed stocks are likely to be found in a variety of areas. In addition, there is evidence that some herring have been imported from the southern Bering Sea into the eastern Bering Sea. This is due to the fact that the herring have been found in a variety of areas within the eastern Bering Sea.

Several surveys have been conducted to delineate spawning areas for herring (Kolasa et al., 1977; Warner and Sherman 1981). These surveys have determined that herring congregate in large numbers, with many larger, and on the continental shelf, and in the open ocean. Herring are also found in the open ocean, and in the open ocean. Herring are also found in the open ocean, and in the open ocean. Herring are also found in the open ocean, and in the open ocean.

Santa Barbara Channel

Oil Spills

Oil spills can have a significant impact on marine life. Spills of oil can be caused by accidents, such as collisions with ships, or by intentional releases of oil from offshore platforms. Spills of oil can be caused by accidents, such as collisions with ships, or by intentional releases of oil from offshore platforms. Spills of oil can be caused by accidents, such as collisions with ships, or by intentional releases of oil from offshore platforms. Spills of oil can be caused by accidents, such as collisions with ships, or by intentional releases of oil from offshore platforms.

1. Additional information is needed to accurately assess the potential impacts of oil and gas development activities on herring and adult herring. A reliable hazard assessment tool for oil spills, if one exists, is needed to assess the potential effects of oil spills on adult herring. If one exists, a reliable hazard assessment tool for oil spills is needed to assess the potential effects of oil spills on adult herring. If one exists, a reliable hazard assessment tool for oil spills is needed to assess the potential effects of oil spills on adult herring. If one exists, a reliable hazard assessment tool for oil spills is needed to assess the potential effects of oil spills on adult herring.

2. Additional information is needed to assess the potential impacts of oil and gas development activities on herring eggs, larvae, and adult herring. A reliable hazard assessment tool for oil spills, if one exists, is needed to assess the potential effects of oil spills on herring eggs, larvae, and adult herring. If one exists, a reliable hazard assessment tool for oil spills is needed to assess the potential effects of oil spills on herring eggs, larvae, and adult herring. If one exists, a reliable hazard assessment tool for oil spills is needed to assess the potential effects of oil spills on herring eggs, larvae, and adult herring. If one exists, a reliable hazard assessment tool for oil spills is needed to assess the potential effects of oil spills on herring eggs, larvae, and adult herring.
dependent on obtaining information on: 1) the effect of oil pollution on productivity of marine plants, 2) coral mortality of seaweed plants due to oil contamination, 3) effects of oil pollution on possible reclamation of previously oiled areas by marine plants and animals, and 4) when the studies produce conclusive results, they will not be available until late 1985 or early 1986, after the 49th planning process is concluded.

A. 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 (Harson et al. 1977, Warner and Shauff 1981). Capelins are known to also spawn subtidally.

Capelins 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, documented in nearshore studies (Harson et al. 1977). They are a highly marketable species and support large fisheries in both the Atlantic Ocean and the Bering Sea. In 1984, a "major" herring fishery for capelin developed in northern Prince William Sound (Alaska) and plans have been formulated for commercial harvests in Houton Sound (Arctic Sea 1985). Therefore, there is a clear need for studies on the biology of this important commercial fishery along the North Alaska Peninsula (Harson et al. 1977), where 28 tons were taken in 1983 (Shaul et al. 1985).

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 Shauff 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

[1.1] Additional information is needed to fully assess the potential impacts of oil and gas development activities on capelin stocks and on the environment. The development of an assessment of potential impacts is dependent on obtaining additional information on: 1) the distribution and abundance of adult capelin, 2) the reproductive strategies of capelin, 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 the absence of information on capelin distribution and on the biology of this species is a significant limitation of their ability to fully evaluate the potential impacts of oil and gas activities on the environment. 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.

[1.2] Additional information is needed to fully assess the potential impacts of oil and gas development activities on the specific substrates (sand and gravel) of capelin. A representative 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 petroleum spills and water pollution (Heyes et al. 1974). However, little work has been performed on the short- or long-term effects of oil contamination on capelin spawning areas. It is expected that oil will penetrate into sand and gravel beaches and persist for several years (Sahmel & 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 areas, information must be obtained on the vulnerability of capelin spawning beaches to oil contamination, the incorporation of pollutants into beach substrates, and the persistence of contaminants in these substrates.

Various studies have documented the lethal, sublethal, and other adverse effects of oil on capelin in the laboratory and in the field. There is little information on the effects of oil on capelin in the field. There is no evidence of adverse effects of oil on capelin. Neither is there any reference to such information in the recent RBA Synthesis Report (McClintock et al. 1969).

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 spill 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 substrate, and 3) the effects of oil contamination on various life stages of capelin.

Public Scrait lance

Introduction
Sand lance are an extremely important forage fish for seabirds, marine mammals, and many fish including salmon. Sand lance larvae have been found to make up 75 percent of...
The spring dipt of herring in the North Sea (Trumble 1973) and 28.2 percent of the European herring diet in Bristol Bay (Straty and Jeancie 1971). In 1960, sand lance comprised 57 percent of the stomach contents of the pelagic for seals sampled in Alaska, ranking it among the leading food items (Schmuck, Alaska Wildlife Commission 1960). Sand lance are not only valuable as 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 1971). 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 (Bay et al. 1974). They are most abundant in depths less than 50 fathoms (91 m) and are most common in areas of low water velocity. The sand lance occurs throughout the Bering Sea and the offshore sand bars (Cleaves 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 periods in areas that may be impacted by bottom substrates and, if in the persistence of contaminants in such 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 sand has been identified as the best spawning substrate, followed by gravel, silt, and mud. Sand lance spawn over 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 (Shadnour 1971).

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

| 1-3 | Additional information is needed to fully assess the potential impacts of oil and gas development activity on all life stages of sand lance. A reasonable 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 coast of the Alaska Peninsula. However, it has been suspected that substantial concentrations inhabit this region. Preliminary results of the 1984 catch data for an ongoing OCEAR/MDA 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 25,272 fish, 25,277 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. Such information is crucial for assessing potential impacts of oil and gas exploration and development. Detailed delineation of spawning habitats and adjacent area is particularly important, because of the vulnerability of these life stages to oil contamination.
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, such as waterfowl, seabirds, and shorebirds regularly breed, stopover through, or overwinter in this region. A majority of the migratory and non-migratory and are therefore managed and protected under the International Migratory Bird Treaty Act of 1918, as well as the International Convention for the Conservation of Atlantic Sturgeon and Birds. This chapter primarily focuses on the bird species of the Bering Sea. The species and subspecies are listed in the following paragraphs.

- **Sand lance**
  - Vulnerable to overfishing and habitat destruction.
  - Dwindling populations due to overfishing and habitat destruction.
  - Need for conservation efforts to ensure continued availability for bird populations.

**Summary**

Sand lance are an extremely important component of the trophic food chain in the Bering Sea. The relative abundance of sand lance in the Bering Sea is at least as high as indicated by limited studies. Major impacts to sand lance could extend 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 at formation areas and drilling masts associated with oil and gas development. Oil spill and disaster clean-up technology can be effective at controlling the fate of sand lance from major oil spills. Important sand lance spawning grounds are a threat. Discharges at formation areas and drilling masts are a threat to sand lance populations. The effects of oil contamination on species' distributions and abundance of sand lance populations are not well known. The effects of oil contamination on species' distributions and abundance of sand lance populations are not well known. The effects of oil contamination on species' distributions and abundance of sand lance populations are not well known. The effects of oil contamination on species' distributions and abundance of sand lance populations are not well known. The effects of oil contamination on species' distributions and abundance of sand lance populations are not well known. The effects of oil contamination on species' distributions and abundance of sand lance populations are not well known. The effects of oil contamination on species' distributions and abundance of sand lance populations are not well known.
to limit brant harvests, and the association of Village Council Presidents for the Yukon-Yukon 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 annual flyover fall below 120,000 birds, all brant hunting along the Pacific Flyway would be prohibited. The next recent count of brant along the Pacific Flyway is 121,012 birds and, in a recent survey, there were significantly fewer nesting birds in 1986 than in 1985.

In addition to the lagoons, seabirds and some waterfowl species rely heavily on offshore areas of the southeastern Bering Sea for feeding. Cerulean, or seabirds in the pelagic waters are highest in summer and fall. When up to 210 birds per km² have been surveyed (Staake and Hunt 1981). However, few pelagic surveys of marine birds and waterfowl have been conducted to evaluate avian use of the area and migration. Fewer studies still have been conducted during winter (A. Nelson 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 waterfowl. 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 is limited. However, the sensitivity of waterfowl varies by species, life stage, and time of year (Kolbe 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 reality there are still major gaps in our knowledge and understanding.

Data Gaps

1. Insufficient information is available on accurately assessing the potential effects of noise and disturbance on waterfowl and marine bird species. Data are limited in terms of the range of potential impacts, the range of potential impacts, and the range of potential impacts.

2. The effect of habitat degradation on avian populations, and 2) the effects of distance at which staging waterfowl reactions to aircraft disturbance and other sources of noise and movement are sufficiently miniaturized.

Of the studies conducted to date on the effects of noise and disturbance, few address the effects of aircraft disturbance (Darsen et al. 1979, 1982; Nelson 1974; Simpson et al. 1982; 1984). Fewer studies have been performed on the effects of human presence, drilling operations, and compressor station noise on staging waterfowl species (Barry and Springer 1979, Gilling and Hart 1974, Gilling et al. 1976, Fries 1979, Pacific Waterbird Flyway Council 1991).

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 excessive 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 to staging waterfowl. Leased helicopter operators at the Islebeeck Lagoon have noted that large flocks of black brant are taking to the air nearly every time a helicopter passes over the lagoon, even when above the designated altitude. In addition, the overflights of a single, rotary-winged aircraft flying at 1500-2000 feet disoriented a group of several hundred black and emperor geese from feeding areas approximately two miles away. These birds remained airborne for up to 10 minutes (Islebeeck pers. comm.). As a result, state and federal biologists are concerned that this additional energy expenditure may be reducing the necessary fat reserves to migrate successfully, which could ultimately increase mortality. With no conclusive information currently available, however, to determine at what elevation or lateral distance helicopters can safely pass over or around Islebeeck
Lagoon without causing disturbance to black brant or emperor. Additional research on disturbance thresholds is needed in order to ensure that existing visual flight rules are adequate to protect breeding black brant and emperor in the Izembek Lagoon unit and elsewhere along the Alaska Peninsula.

Secondly, although the U.S. Fish and Wildlife Service has identified visual flight rules that avoid disturbance to nesting birds, the effectiveness of such rules critically depends on weather conditions and the capacity of the observer. These rules can only be applied where 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 nesting birds. In order to maximally protect nesting birds, protection of already declining waterfowl populations will require that buffer zones, 5000 feet wide, be established around nesting sites, which can only be open if there is a complete absence of disturbance. Such protection in the Izembek Lagoon can be achieved only by an end to the present heavy use of the Kenai Highway that passes through the breeding grounds of these species.

(2.1) Additional information is needed on the distribution and abundance of common wintering seabirds and waterfowl in the HAB to fully assess the potential impacts of oil and gas development.

As noted earlier, few surveys have been conducted to determine 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 2,340 birds per km² reported for a 1.3 km² area near Zemlya Island (Arenstorf et al. 1981). Although evidence that large numbers of birds may use the HAB during winter comes from observations of walruses, where an estimated 100,000 walruses died from severe winter storms in 1979, Blvd. 745.8 (Huff and Hancock 1980). These observations, however, do not quantify the population size or its distribution and waterfowl likely spend most of the time on the surface when not foraging, rather than attending roosts on cliffs and power-plant areas, and are, therefore, more vulnerable to oil contamination.

The potential for impacts to bird populations could be significant because oil exposure can cause: (1) sublethal conditions in the HAB during winter and the resulting long-term effects on oil spill containment and cleanup measures, especially in severe sea states, and (2) the unmitigated potential for large groups of birds to be exposed to oil spills due to adverse weather conditions. In order to evaluate the risk to bird populations from oil spills, more information needs to be obtained on the distribution and abundance of birds in the North Alaskan 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 buffer zones. Additionally, the risk of a major oil spill depends upon actions to develop oil and gas resources. In order to adequately assess the risk to seabirds and waterfowl, additional information is needed on the distribution and abundance of all species of seabirds and other oil and gas activities on the outer continental shelf, 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. 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 HAB vicinity. Approximately 4,000 sea lions, 30,000 harbor seals, 15,000 walrus (primarily males) and 17,000 sea otters utilise Bering Sea habitats during all or part of the year (Post et al., 1987). All marine mammals are protected under the Marine Mammal Protection Act of 1972. Some species (e.g., sea otters, Steller sea lions) are also protected under the Endangered Species Act of 1973.

Ultima Thule, which is adjacent to the lease sale area, should not be considered a significant corridor for numerous species of marine
hemuses moving into and out of the Bering Sea. Virtually the entire eastern Pacific whale population, estimated at 15,000 - 17,000 individuals, and approximately 1.2 million northern right whales during their spring and fall migrations (Hugh and Shrewsbury 1979, Lasherswood et al., 1983). Although salmon are also regularly used by fin, humpback, and bowhead whales in the Bering Sea, movement patterns of these species are poorly documented. Resident humpback whales and bowhead whales of the Chukchi pack include stellar sea lions, harbor seals, and possibly killer whales (Brunet and Britton 1951). A resident population of brown bears (Ursus arctos) probably feeds on gray whales that stranded on beaches in the eastern Bering Sea during peak migration periods of gray whales in the fall. These bears will not enter the pack ice, so they may not necessarily avoid oil contaminated water (Gonsalves et al., 1981). The effects of oil on potentially sensitive tissues such as the skin, eye, or respiratory system are not well defined. Albers (1980) stated that adverse effects of oil contact with baleen whales could include: 1) conjunctivitis and corneal inflammation leading to reduced vision and possibly blindness, 2) development of skin ulcerations from breaking down the protective layer of the skin surface, with subsequent aspiration of bacteria, and 3) development of bronchitis associated with 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 Slope. 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.

Delineating 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 (Svendsen 1975, Davilery 1977, Waller 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 Holman 1971, Stenehjelm and Swain 1980, Lowery 1980). Therefore, the strong belief that once gray whales move into nearshore, and estuarine waters along the north side of the Alaska Peninsula, many of them began feeding. During three spring aerial surveys, 50-60 percent of the whales seen within 1 km of shore between Unalak Pass and Naknek were trailing mud plumes or were on their sides characterizing feeding behavior (Gilli and Hall 1993). This observation is important because it indicates that

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 eastern Bering Sea during peak migration periods of gray whales is likely to jeopardize the continued existence of the species..." (1984). While the effects of oil on northern right whales and other Pacific species of baleen whales are unknown, it is generally agreed that they are more susceptible to the effects of oil than are fin whales or sperm whales. Therefore, a viable, and potentially sensitive, population of gray whales awaits a potentially catastrophic exposure to oil. In addition, a resident population of brown bears (Ursus arctos) probably feeds on gray whales that stranded on beaches in the eastern Bering Sea during peak migration periods of gray whales in the fall. These bears will not enter the pack ice, so they may not necessarily avoid oil contaminated water (Gonsalves et al., 1981). The effects of oil on potentially sensitive tissues such as the skin, eye, or respiratory system are not well defined. Albers (1980) stated that adverse effects of oil contact with baleen whales could include: 1) conjunctivitis and corneal inflammation leading to reduced vision and possibly blindness, 2) development of skin ulcerations from breaking down the protective layer of the skin surface, with subsequent aspiration of bacteria, and 3) development of bronchitis associated with 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 Slope. 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.

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A significant portion of the eastern Pacific gray whale population uses 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 principal areas affected.

The relative importance of such "migratory" feeding areas to the overall population is currently unknown. Still, and Wall (1984) suggested that the use of such feeding areas might be susceptible for survival, due to several prior months of near fasting and the energy demands associated with the long, arduous migration. Further, 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 year. Studies have shown that gray whales have addressed behavioral reactions of migratory gray whales to playbacks. No effects have been observed. The North Aleutian Shelf as a "migratory" feeding area, information is needed to determine if similar avoidance reactions are exhibited by feeding gray whales.

The NOAA has recognized this information need and an OCSMP study is currently investigating the behavioral response of feeding gray whales to acoustic stimuli (until 1983). However, if the studies produce conclusive results, they will not be available until late 1983 or early 1984. In the future, the data gathering will continue.

Summary

Determining the behavioral response of feeding gray whales to acoustic stimuli is essential to the accurate estimation of potential impacts of oil and gas development in the area.

The most vulnerable of all marine mammals is the gray whale due to the direct effects of oil. Accurate knowledge on the effects of oil and gas development activities on whales is essential to the accurate assessment of potential impacts of oil and gas development activities on sea otters.

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 been previously documented for Alaska otters. Several observations have been made of large migrations through False Pass (Dennett, 1973). However, another possibility is that visibility or non-uniform distribution of sea otters may account for the observed distribution of sea otters. Such migration may have affected the 1982-1983 results. The non-uniform distribution is important, because only a survey during a single year 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, 1980). Thus, aggregations of sea otters in a limited area may significantly bias sea otter estimates.

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 the effects of oil and gas development activities on sea otters is essential to the accurate assessment of potential impacts of oil and gas development activities on sea otters.
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 known, specific information on their utilization of coastal areas is not readily available. Studies regarding availability of marine mammals for exploration, development, and production activities on marine mammals have included analysis of their behavior and cetacean data, and air disturbance factors associated with both onshore and offshore activities.

The North Aleutian Shelf is especially important to gray whale and sea otter populations. It is a major migration corridor for these species. The shelf is a potentially important feeding area. The rich benthic community of the region supports a very dense population of marine mammals 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 oil 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. Ice-embedded lagoons contain the largest mean grass stands in the world. Microbial degradation of eelgrass detritus is a major regional process affecting most trophic relationships and energy transfers among regional inhabitants. Eelgrass leaves support large numbers of epiphytic organisms with a total biomass perhaps approaching 5% of the eelgrass tissue. Food webs are very short in the estuaries, with high energy transfer rates from seagrass to intertidal 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 growth 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 hydrocarbons contamination on eelgrass. Available information on other seagrasses indicates that the toxicity of oil and the recovery time for oil-damaged mature eelgrass beds vary significantly depending on factors, including the type of oil spilled (e.g., crude or No. 2 fuel oil, No. 6 fuel oil, etc.), and the exposure. Studies performed specifically on eelgrass, one laboratory experiment indicated that exposure to hydrocarbon contamination reduced productivity (Mickey and Williams 1977). Another study found that eelgrass accumulated significant levels of hydrocarbons when growing in oiled sediments (Vandeneuwen and Gordon 1981).

Data Gap

(1) Additional information is needed on the type and potential of oil spills to impact on important eelgrass beds, particularly in temperate zones. If possible fields are to be adequately evaluated.

Oil contamination of eelgrass beds is likely if an oil spill reaches the northern shorelines of the Alaska Peninsula. Contamination may reduce productivity of these plants; cause outright mortality; and alter substrates so that respiration by plants may be hindered. If the growth of these plants is affected, or the plant surfaces are contaminated, the ecosystem may be degraded. In addition, the world populations of black brant and several sea birds rely on Bristol Bay eelgrass beds, particularly those at Ice-embed lagoon, as a primary food source prior to their summer 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 seagrass, 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 of impacts of oil and gas exploration and development. This is especially true when activities are conducted in an area as biologically rich as the Bristol Bay region. Many of these biological resources (such as the 1.1 million salmon for the year 1979) are included in the Aleutian Islands and the Bering Sea and virtually the entire world populations of pink, sockeye, and chum salmon and Steller's eiders, and the world's largest, Sable Island, are extremely vulnerable to oil spills. Consequently, an accurate evaluation of the probability of connecting a successful major open ocean oil spill cleanup operation is needed to determine 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 1969's and 1979's, oil and gas companies are making considerable effort to develop open ocean oil spill contamination and removal procedures. However, considerable debate exists regarding the capability to respond to major open ocean oil spill events. A ten-year overview of oil spill cleanup at sea concluded that recovery of significant quantities of oil from the open sea has never been achieved for an open ocean spill. The oceanographic and meteorological conditions, as well as the logistical remote location, of the NAB, are present barriers to effective oil spill response actions. For example, the winds in the NAB exceed 185 mph approximately 50 percent of the time, and visibility is less than a fourth of a nautical mile approximately 50 percent of the time (Kramer et al. 1977). Such conditions severely hinder oil spill response actions.

Data Gap

1-1

A compilation and analysis of information relating to oil spill response capabilities is necessary to accurately assess the capability of successful open ocean oil spill cleanup operations. 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 effects. 3) oil spill response exercises conducted by the Coast Guard and the oil industry, 4) manufacturer equipment specifications, and 5) oil spill behavior report. 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 NAB is currently planning a study of this nature for the Bristol Bay Region. An objective study is warranted since the NAB's DSEA for Sale 32 states that "risks from oil spills would be mitigated...by any oil spill countermeasures which would be attempted" (p. 26). However, no information is available 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 sockeye salmon, waterfowl, and seals and habitats such as Tresiba 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 in the mitigation measures for a major oil spill are: 1) the NAB's DSEA focusing on the NAB's OCS drilling, 2) the NAB's OCS drilling contingency plans, and 3) the effectiveness of offshore cleanup activities. Such is considered difficult to predict (p. 3). In addition, there are no existing technology to contain and cleanup a major offshore spill. An adequate 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 mitigation 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.
exploration, development, production, and transportation in the
HAB. 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 set before adequate mitig-'
apation strategies can be developed. Further, it has been
particularly essential in the HAB, 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 NMD, and OCEAP 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 HAB 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 properties of oil to the benthos and
estimates of quantity 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
organisms particularly intertidal, shallow subtidal, 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
have been identified through the existing programs. Further
mitigation proposals will not likely alleviate the identified
problems. The limited time available to prepare this report
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 HAB. Additional concerns that should be carefully
considered are included in the department's comments on the IDES.

LITERATURE CITATIONS

Fish., Naknek. 187 pp.

Anchorage. 13 pp.

Albert, T., ed. 1981. Tissue structural studies and other investigations on the biology of endangered whales in the
Beaufort Sea. Report to the Bureau of Land Management, Alaska, Department of Environmental Science, Div. of
Maryland, College Park. 293 pp.

Arctic Sea. 1983. Capelin = The feasibility of establishing a
commercial fishery in Alaska. Rep. to Arctic Sea Inc.,

1983. Distribution and abundance of decapod crustacean
larvae in the southeast Bering Sea with emphasis on
commercial species. Final rep. to NOAA/OCEAP, RE-609.
408 pp.

habitats and species. Papers 35-114 in L.R. Thorsteinson,
Ed., Proceedings of a synthesis meeting: The North
Aleutian shelf and its possible consequences of offshore oil
gas development. USDC: NOAA/USDI: NWS. Juneau, AK.

Arneson, P.D. 1981. Identification, documentation, and
delineation of coastal migratory bird habitats in Alaska.
SU 3. Papers 1-162 in Environmental assessment of the Alaskan
continental shelf. Final reports of principal investigators. Vol. 15: Biological studies. USDC: NOAA,
ONPA: USDI: BLM.

oil in Arctic marine ice, water and sediment ecosystems:
degradation and interactions with microbial and benthic

on the Alaska Peninsula and Unimak Island. Condor

Berry, T.W. and R. Spencer. 1974. Wildlife response to oil well
Ontario, 15 pp.
ENVELOPE 2

Recommended Revisions to the Sale 92

Proposed Mitigation 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 mitigation 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, included only to attract interest of proposed mitigation measures. We believe the existing mitigation measures are clearly inadequate and will recommend the following:

1. Develop a comprehensive program to mitigate activities associated with the lease sale.
2. Require the lessee to develop a program to mitigate activities associated with the lease sale.
3. Require the lessee to develop a program to mitigate activities associated with the lease sale.
4. Require the lessee to develop a program to mitigate activities associated with the lease sale.
5. Require the lessee to develop a program to mitigate activities associated with the lease sale.

In light of recent comments from the George S. George lease hearings, we recommend that the DOI develop a program to mitigate activities associated with the lease sale.

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- STIPULATIONS -

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 sentences be incorporated into provision (2)(a) of proposed stipulation No. 1:

Prior to commencing any operations, the lessee shall prepare a report identifying and describing all potential cultural resources that may be affected by the lease sale. The report shall be prepared by an archaeologist and a geophysicist. The report shall be submitted to the DOI and the State within 30 days of the lease sale.

Stipulation No. 2 - Orientation Program

The stated mitigation effect of this stipulation is that, 'it would make workers aware of the special environmental, social, and cultural values of the region and the area. It would also provide necessary information to the 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-14). For workers to effectively 'reduce conflicts', resulting from 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 information on the unique environmental, social and cultural values of the area. This would be done by the lessee operating stipulations and Title III 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 Atlantic Basin (NAB).

Stipulation No. 3 - Protection of Biological Resources

As presently written, the Regional Supervisor of Field Operations (RFO) is not required to consult with the Bering Sea Biological Task Force (BSBT) in implementing the stipulation. We concur with the DOI's determination that: "The involvement of the Bering Sea BSBT 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 BSBT 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 BSBF may require of the lessee or on other information available to the BSBF or the special biological resources, the BSBF may require the lessee to: (1) evaluate the size of operations; (2) establish to the satisfaction of the BSBF, on the basis of a site-specific survey, whether such operation will not have a significant adverse effect upon the resources identified; or that a special biological resource does not exist; (3) operate during those periods of time as established by the BSBF, that do not adversely affect the biological resources; and/or (4) modify operations to ensure that significant biological resources or habitat features

DEERING PROTECTION ARE NOT ADVERSELY AFFECTED. IN MAKING SUCH A DETERMINATION, THE BSBF WILL CONSULT WITH AND
The language as provided above is similar to that provided under Information on Oilspill Contingency Plans in the Norton Sound, Nuvukin Hill and St. George Basin Notice of Sale (NOS).

Information on Areas of Special Biological Sensitivity

The IIT covering Information on Areas of Special Biological Sensitivity should be modified to include Valuks Island and the adjacent Sea Lion Rocks. Sea Lion Rocks is the only large sea lion rookery along the northern Aleutian Peninsula and, since 1975, up to 2,000 sea lions have been hauled out on these rocks annually. Approximately 2,000 sea lions also rest 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 IIT for Areas of Special Biological Sensitivity has incorrectly identified Valuks Islands as a State game refuge and Cape Newham as a State game sanctuary. Valuks Islands is a sanctuary and Cape Newham is a refuge.

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

"Due to the sensitivity and vulnerability of these areas to spilled oil, special attention will be given to deployment of contingency plans and the implementation of 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 IIT should be revised to show that the biological impact statements should be provided to the Bering Sea Biological Task Force, and that the State 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 Isseebuck Lagoon when large numbers of waterfowl are present. This ITL currently recommends that aircraft maintain a 1,000 foot vertical distance from observed or known wildlife concentrations, which would include waterfowl assemblages in Isseebuck Lagoon. However, research with helicopter flights over the lagoon in support of the Department of Agriculture's Wildlife Survey Project near George Basin, indicates that this flight requirement is not necessary, and allows unnecessary disturbance to black brant and emperor geese. Virtually the entire world populations of these two species stage in the Isseebuck Lagoon vicinity during fall. Moreover, black brant are known to be very sensitive to disturbance during the fall moulting 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 Aleutian East Coastal Resource Service Area Board is particularly concerned about flights over Newport Lagoon, Big Lagoon, Hook Bay, Pt. Catherine's Cove and Dawson Lagoon. The Aleutian East Coastal Management Plan currently contains outlined 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 vessels or probable oil spill risks should be made stipulations of the ROFO. Such a stipulation was included in the OCS stipulations. The State would expect endangered whales in the NAR to be afforded the same level of stipulatory protection as provided in the Haverin Basin, absent information to the contrary. We propose the following language:

"Lessees are advised that the ROFO 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, or if it is determined that the whales are outside of the zone of probable influence or are no longer subject to the likely risk of oil spills. Unless the ROFO 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 whales. Once terminated, permissions to this stipulation, exploratory drilling operations shall not resume until it is determined by the ROFO, 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 circulating applications for seismic surveys to State and local governments for review and comment, and by adopting the following two provisos:

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 NAR ROFO consistent with its inclusion in the Morton Sound, Haverin Basin and St. George Basin ROFO as follows:

"Lessees are notified that oilspill contingency plans are required. Lessees are notified that oilspill contingency plans are required under Alaska Outer Continental Shelf (OCS) Region OCS Order No. 1, pursuant to the authority prescribed in 30 CFR 250.11, 250.34, and 250.49, prior to approval of exploration plans and development and production plans. Furthermore, lessees are required under 30 CFR 250.34-2 to provide in their plans for development and production plans, descriptions of all environmental safeguards. Prior to approval of development and production plans the ROFO will..."
review these items to determine whether these oil transport facilities described which are regulated by RFS 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 IEP on coastal zone management.

ENCLOSURE 3

Comments on the Sale 92 Draft EIS Resource Assessment and Fisheries Harvest Discussion

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

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 currentsale area boundaries. Because of this, portions of the assessment are confusing and inaccurate.

Example: "Except in northeastern Bristol Bay, where large colonnes are located, the contribution of breeding birds to density north of the peninsula is relatively slight, and the lack of open water in winter precludes high density over much of the area east during that season (emphasis added)" (page 111-51). This statement is essentially true for the original sale area, but not for the current sale area. Consequently, this statement is not accurate in relation to the revised lease sale proposal.

Example: "A right whale was sighted in the lease area at 55°37'N, 167°12'W (Herbin and Moynin, 1962)" (page 111-9-29). Again, this statement refers to the original sale area. The current lease sale proposal does not extend as far north as 55°22' 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.

Example: The recently established capelin fishery in Bristol Bay is not discussed in the harvest section.
In 1984, a fishery for capelin developed in northwestern 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 decision and acknowledge the potential for a capelin fishery in the TAL 92 vicinity.

**Example:** The resource assessment does not mention the importance of the southeastern Bering Sea as a resting and feeding area for gray whales. Approximately 24 percent of the haddock between ages 5 and 12 that year in the Bristol Bay region return to the Pacific Ocean through Unimak Pass. This information is relevant to the draft EIS impact assessment, because a major oil spill event could potentially impact haddock populations that are harvested far from the Bristol Bay region.

**Example:** On page III-9-13, the draft EIS states that the southeastern Bering Sea haddock stock "remains depleted." Although this was true a few years ago, the population has been increasing in recent years and this is not an accurate statement.

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 Holz vicinity, which represents over 50 percent of the entire Aleutian tern population. The Icemak Lagoon and Port Holz areas also provide breeding habitat for this species.

The resource assessment frequently fails to acknowledge the limitations of available data, when appropriate. As a result, reviewers may not be aware that some of the information in the TAL 92 vicinity may be inadequate to conduct a responsible impact assessment.

**Example:** The draft EIS assessment 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-nautical-mile 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-9-14 through III-9-17) gives the impression that the nearshore population dynamics of red king crab are well defined in the TAL 92 vicinity.

**Example:** Prior OCS/AP studies (Research Unit 612) funded by the NAB have stated that the southbound migration route for gray whales is poorly documented, but appears to be less coastal and more diffused 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-9-22).

**Example:** The NAB 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 some of 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 Jeschke 1980; Straty 1982) or from casual observations." The draft EIS assessment does not acknowledge this lack of information in its discussion of seaward migration routes of juvenile salmon (pages III-9-2 through III-9-5). 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 include all aspects of the region. Although it is important to consider the region-wide implications of the lease sale proposal, it is equally important to highlight areas warranting specific consideration. In the TAL 92 vicinity, there are three particularly productive areas which should be specifically acknowledged. These areas are identified and discussed in Troublebe 4.
ENCLOSED 4

Areas of Primary Concern in Relation to Proposed Sale 31

The southeastern Bering Sea is one of the most productive fishing and wildlife resources in the State. In some respects, the biologic productivity of this region is unparalleled anywhere in Alaska and perhaps the world. Although the Sale 31 draft EIS provides a description of both fish and wildlife resources in the southeastern Bering Sea, it does not highlight areas of primary concern in direct 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 Pribilofs Islands. These areas provide unique critical fish and wildlife habitats for a variety of species.

These species are not only of regional and statewide 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 HAB 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 goose stage at Isebuk 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 small minority of the world population winters along the west coast of the Alaska Peninsula. A group of approximately 400 or 500 kelp geese winter at the Isebuk area. Isebuk is approximately 10 miles to the west of Atakalep Lagoon on Bristol Bay, Unimak Island (Kavik pers. comm.) In addition, approximately 1,000 Alaska terns breed in the Fort Moller area, which represents over 50 percent of the total Alaska tern population. The Isebuk Lagoon and Fort Morden areas also provide breeding habitat for the California gull.

The lagoon systems adjacent to the HAB also support large concentrations of Twamnerl’s Canada goose, and hundreds of thousands of each of several species. Steller numbers of geese, Brant, 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 coastal area and interior areas of the Bering Sea. The Isebuk Lagoon has been classified a State Game Refuge, and Fort Moller is a designated State Critical Habitat. 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 in the Isebuk Lagoon. During the fall, the Isebuk Lagoon (155 birds/km²) and Nelson Lagoon (849 birds/km²) 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 Isebuk Lagoon (1,046 birds/km²) and Nelson Lagoon (146 birds/km²). Large concentrations of marine birds were also noted in Fort Moller (618 birds/km²) (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, as Alaska’s leading sea otter community is concentrated at 70 years, sea otter populations in the Bering Sea have been recovering from overexploitation during the 1970’s and year’s. Approximately 75,000 – 18,000 otters currently inhabit the area. Highest densities occur along the western Alaska Peninsula from Cape Meares to Cape Lecontech. Sea otters are year-round residents and critical life functions (e.g., ttumping) 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 Laska Cape vicinity. A small colony feed in this area too, primarily in water depths of less than 15 feet and within 15 miles of the shoreline. As sea ice retreats, otters and sea lions 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 Fort Moller/Cape Denali 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 staging areas for Pacific salmon. An estimated 12.5 to 15.5 million adult salmon occur in the Bering Sea, sockeye salmon make up the majority. In addition, 145 to 930 million juvenile salmon enter the Bering Sea annually (Naka 1991). 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 (Naka 1991). Many move through Unimak Pass and other Aleutian passes into the Pacific. While salmon move offshore, others remain in the nearshore waters in the vicinity of their natal streams before moving island 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. Many species of bottom feeding crab are generally found up to 160 km offshore between Unimak Pass and Port Moller (Naka et al. 1991). Juvenile salmon and whitefish are also found in nearshore waters from these passes. In addition, salmon and cod spawn (Bureau of Land Management 1991). Sockeye salmon, which peak abundance from early May to mid-July, occur in large concentrations along the North Aleutian shelf from Unimak Island into Bristol Bay (Naka 1991). Although virtually no information is available on the distribution of first, second, and third year juvenile, it is assumed that they are restricted to the nearshore areas. Bristol Bay is also an important rearing area for 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 around Unimak Island. 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 14 percent of the world population, also migrate primarily through Unimak Pass on their migratory route and from the Pribilof Islands (Naka 1991). Resident species of the Pribilof Islands include Steller sea lions and harbor seals (Everitt and Brahale 1981); Unimak 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 (Naka 1991). 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 brown pelicans, are frequently found in and near Unimak Pass. In addition to marine mammals and seabirds, Unimak Pass has been recorded for Unimak Pass in the fall (Naka 1991). The mean density of All marine birds in Unimak Pass during the summer is 224 birds/ha, which corresponds to a population estimate of over 750,000 birds (Naka 1991). 3. Pribilof Islands The Pribilof Islands are probably the most important area for marine mammals and seabirds in the Northern Hemisphere (Naka et al. 1974). From May to November, approximately 1,500 harbor seal and Steller sea lion pups are born on the Pribilofs each year (Naka 1991). 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 sea lions, Steller sea lions and harbor seals are also found on the Pribilof Islands. Steller sea lions are a sea lion breeding rookery, and approximately 1,500 harbor seal pups inhabit the area year round. Rundin, bearded, and spotted seals frequently occur in the vicinity of the Pribilofs, but do not breed in the area. Pribilof Island is a popular stopover area in the fall for the Pacific black-footed albatross, many of which spend the winter on 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 colonize 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 (Naka et al. 1974). Colonial nesting, utilizing the Pribilofs include approximately 85 percent of the world population of sea-lipped witties (approximately 222,000) and the world's largest
A colony of thick-billed murre (over 1.5 million) (NOAA 1981, Bulese et al. 1976). 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 breeding. Seabird abundance fluctuates, with peaks occurring during post-breeding. This indicates low productivity, leading to adequate feeding conditions. Seabirds also utilize the oil and gas fields. Colonies on gravel islands and near production platforms and pipelines provide essential feeding habitat. Most foraging occurs within 20 km of the islands, with highest densities (41 - 350 birds/km²) occurring within 5 km of the platforms (NOAA 1981; Bulese et al. 1976).

**Literature Cited**


NMFS. 1980. Living marine resources and commercial fisheries relative to potential oil and gas development in the northern Aleutian Shelf area (Tentative Sale No. 75). NOAA. NMFS. Seattle, WA. 52 pp.


Sowell, A.C., B.A. Hushie, and C.C. Lensink. 1978 Catalog of Alaskan seabird colonies. USDI: FWS.

Critique of the Draft EIS Impact Assessment, for Sale #2

While the draft EIS provides much useful information on environmental and social issues associated with leasing in the north Alaskan basin, some of the data may not be adequate or accurate due to the lack of comprehensive studies or the incompleteness of the data. The assessment methodology is based on a number of assumptions that may not be valid. For example, the analysis assumes that the impacts of leasing will be confined to the areas specifically identified in the EIS. However, these assumptions may not be valid because the impacts of leasing could extend beyond the areas identified in the EIS. Therefore, the assessment may not adequately address the potential environmental impacts of leasing.

The DOIs index of impacts is a primary constraint to an accurate portrayal of environmental consequences. The index does not account for the overall degree of potential environmental consequences by analyzing impacts on regional populations, and discounting impacts on local populations. Such an approach does not apply well to the Alaska region because local populations often represent an economically important or abundant resource and in some cases, the local populations are also threatened. In addition, the index does not account for the potential for migration of salmon from the Mackenzie and Porcupine river systems, which are often used by more than one hundred species of salmon.

The draft report on the level of oil and gas exploration and development activities appear very conservative. The draft report does not account for the potential environmental impacts of leasing and may not adequately address the potential for migration of salmon from the Mackenzie and Porcupine river systems. Therefore, the draft report may not adequately address the potential environmental impacts of leasing.

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 recruitment from other areas. These populations experience high mortalities.

The DOI's index of impact categories. (i.e., major, moderate, minor, and negligible) are also misleading, because they do not accurately portray the described level of impacts. Since the index is based upon effects on regional populations, the terms of living impact categories should be reflective of the predicted environmental consequences. Therefore, the definitions of a "major" index on biological resources as: "A population or species decline in abundance and/or distribution beyond which natural recruitment would not return to its former level within several generations" (Table 2-1). The draft report states that a major impact could occur to red king crab in larger spills impacted seawater areas along the North Alaskan coast. Based upon the definition of a "major" impact, this would mean a 90% decline in the population of red king crab in larger spills impacted seawater areas along the North Alaskan coast. Based upon the definition of a "major" impact, this would mean a 90% decline in the population of red king crab in larger spills impacted seawater areas along the North Alaskan coast.

The draft report predicts that on the level of all oil and gas exploration and development activities appear very conservative, and therefore do not anticipate environmental impacts. The following levels of oil and gas related activities are predicted to result from the proposed alternatives: (1) 1,100 miles of seismic exploration and five delineation wells, (2) 20 oil fields, and (3) 10 gas fields. A review of recent offshore oil and gas activities indicates that the predictions are highly questionable. According to U.S. Geological Survey data, over 2,000 miles of seismic lines were drilled along the north side of the Aleutian Trench in 1974 alone. In the adjacent St. George Basin, five exploration wells were drilled in 1974 without any apparent commercial discoveries, and over 60 exploration and delineation wells were drilled in the Bristol Bay/Southeastern Alaska area prior to any oil and gas production. Finally, BONDO recently announced the construction of an additional 12 oil wells in the arctic region and 10,000 miles of seismic lines were drilled in the arctic region.

The issue is concerned about the DOI's conservative development estimates because they result in a more rapid development of the North Slope. Therefore, the issue recommends that the DOI should not rely on the draft report's predictions and should conduct a more comprehensive environmental impact assessment.

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Another problem with the draft EIS is the practice of downplaying potential spills. The highest probability estimate for the North Slope H.A.S. EIS based on spill predictions on the projected oil production potential suggests that a mean volume of oil and gas expected to be recovered from the H.A.S. in the 1970's would be approximately 1 billion barrels. For the hypothetical development scenario studied, the D.O.P. in developing the northern H.A.S. EIS is to consider the maximum production scenario as the standard by which environmental consequences are measured. Hence, the estimated maximum production of 750 million barrels of oil, the draft EIS predicts that approximately two spills greater than 1,000 barrels will occur in the H.A.S. and that a 14 percent chance exists for a spill greater than 100,000 barrels. These spill estimates would be considered conservative because they do not include spills associated with transporters and are partially based on statistics gathered outside of Alaska. These areas pose considerably lower hazards from factors such as earthquakes, tsunamis, extreme oceanographic and meteorological conditions.

The H.A.S. draft EIS refers to the St. George Basin Final EIS for analysis of earthquake/tsunami hazards. The St. George Basin EIS characterized the North Alaskan sale area as having high 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 possibility of local tsunami heights of approximately 30 feet. The oil spill risk analysis data, even if it is largely based on data and probabilities, 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 hazards to coastal shorelines. The draft EIS states that under the prevailing west to southwestly 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 D.O.P. in May of 1974 substantiates this prediction. All returns from bottles released in or immediately adjacent to the proposed sale area (8 drop areas, 46 return) have been found along the north shore of the Alaska Peninsula, from Iliamna Lagoon to Pilot Point. The D.O.P. has intensified the Port Mollis Resource Area as the area most at risk for oil spills with an up-to-99.3 percent chance for oil to contaminate resource areas within 3 days. Additionally, under maximum production estimates, 1.2 spills exceeding 1,000 barrels in volume are expected to occur as a result of pipeline transport of oil. In the development scenario, the proposed pipeline from the H.A.S. to a deepwater

- 3 -
tanker terminal is projected to traverse completely across Port Moller and Tredavun 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 estimated, and a high probability exists for the port spill occurrence within the late spring to early fall period, the draft EIS predicts that the following "major" and "moderate" impacts would occur.

- 4 -

<table>
<thead>
<tr>
<th>Resource Category</th>
<th>Draft EIS Predicted Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>King Crab</td>
<td>MAJOR</td>
</tr>
<tr>
<td>Commercial Fishing Industry</td>
<td>MAJOR</td>
</tr>
<tr>
<td>Marine and Coastal Birds</td>
<td>MODERATE</td>
</tr>
<tr>
<td>Salmon, Clupeiformes (forage fish including herring and capelin)</td>
<td>Groundfish, Crabs and Inkfishes (excluding king crab)</td>
</tr>
<tr>
<td>Pinnipeds and sea otters</td>
<td>MODERATE</td>
</tr>
</tbody>
</table>

These predicted environmental consequences are quite serious given the D.O.P.'s definitions of "major" and "moderate" impacts (Table 8-1). To provide a clearer understanding of what these impacts involve, the following table outlines potential effects, as defined in the Environmental Consequences section of the draft EIS, for a spill in the Port Moller Resource Area.

<table>
<thead>
<tr>
<th>Resource Category</th>
<th>Potential Environmental Consequences</th>
</tr>
</thead>
</table>
| King Crab         | Serious effects on game and sportfish, developing embryos, causing birth defects, juveniles potentially reducing the

- 5 -
Commercial Fishing Industry

Fouling of fishing gear, closure of fishing grounds, taking 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 shorebird flocks which may approach 2,500 birds/sq. km. Major effects to large proportions of several waterfowl species including black brant, eider, goosander, kelp gulls, and Canada geese, as well as substantial numbers of other shorebird species and shorebirds in oil-contaminated inlets or hotspots on the lagoon. High mortality to large numbers of birds at oil-soaked beaches and islets. Direct mortality to shorebirds and gulls with mobilities of 65 to 122 birds/sq. km 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 eggs depending on spread of oil spill and degree of oil weathering prior to impacting nearshore areas.

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.

Crabs and Invertebrates

Crabs and invertebrates (e.g., Homarus americanus) and smolt stages of surf clams and eels, larvae, and 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 in the Alaska Department of Fish and Game believes the DOD’s estimate of sea otter vulnerability 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 area 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 DOD, oil spills EIS predicted to occur in the Port Moller Resource Area would significantly impact the critically productive Port Moller Resource Area is the most likely areas to be impacted by such spills.

Although the draft EIS is weighted towards impacts associated with a large oil spill, 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 inshore waters as dissolved hydrocarbons.
impacts to commercial harvest activities is probably erroneously

United States Geological Survey (USGS) figures indicate that over 500,000 miles of previous seismic surveys have already been shot in the NAR. In 1984 alone over 12,000 miles were shot in preparation for sale 92. The DOF's estimate of 1,561 trawl line miles of seismic surveys is probably also only a fraction of the trawl line miles which will actually be surveyed. For example, in 1984 over 3,000 miles of post sale (1983) data (data trawl lines) have been surveyed in the St. George Basin.

In several cases where acoustic OCS related seismic surveys have occurred in intensively fished areas (e.g., Cook Inlet, Kachemak Bay, Shelikof Strait, Kodiak, buoy and stationary gear), lease has been a well publicized problem. For example, there were several instances between 1975 and 1977 when fishermen alleged that seismic and support vessels involved in oil and gas exploration in the original Cook Inlet area were running through crab pots in Kachemak Bay cutting off the fishing buoys. Similar reports were received in 1976 in Kachemak Bay. Tug boats bringing oil drilling vessels to drilling sites were reported in Kachemak Bay. Tug boats brought vessels to drilling sites were brought to drilling sites and operated the rig and oil drilling vessels without permission for OCS. In 1979, the DOF has received several reports of fishing gear at Bluff Point, cutting off many buoys and dragging others on the rig and oil drilling vessels. There were successful concerns over conflicts between fishing and support activities that fishermen attempted to get the U.S. Coast Guard to establish 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 Kachemak Bay. Fishermen also requested that seismic vessels only operate during daylight hours and employ fishermen observers who could identify and direct seismic vessels around fishing areas. These requests have been partially met.Wyman has agreed to restrict seismic surveys subsided as lease operations declined. Reports of these studies at least a "moderate" problem for a longer period of time than that indicated in the draft EIS.

The DOF has not proposed any measures which would mitigate this potential problem other than the discretionary information to leasees which encourages leaseholders to talk to fishermen about mutually satisfactory ways to avoid fishing gear conflicts. No leaseholds are not submitted for either EEPA or local review and comment. On lease applications any leasing areas proposed for seismic vessel operations to be utilized for seismic surveys during commercial fishing seasons. For example, the DOF has received numerous complaints about seismic vessel operations amongst commercial fishing vessels in Shelikof Strait in 1982, in Bristol Bay in 1983, and in Cook Inlet in 1984.

Given the possibility that 10 to 20 times more trawl line miles of seismic surveys will be shot than the draft EIS estimates, and that these areas, with historically heavy concentrations of fixed gear, it is possible that conflicts between lease activities and fixed fishing gear are likely to be more severe than that indicated in the draft EIS.

The DOF could reduce or eliminate the problem of gear vessel conflicts by circulating applications 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 aerial surveys to the seasons or periods when all commercial fisheries are closed and there is no year 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. Traval Damage

The DSS estimates under estimate the amount of damage to trawl gear which may result from oil industry activities in the area. Based on information provided by the Southeast Alaska Maritime and Seafood Industry Council, the Sheldons Island Fishermen's Association at a conference in Sand Point Alaska (April 18 to 20, 1984), there has been considerable damage to trawl gear in the North Sea as a result of oil industry related derricks and obstructions on the sea floor. The Sheldons Island 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 DSS. That is, unloading en Craig. Second, the Sheldons islands are also in a remote area, with a small population whose livelihood is based entirely on commercial fishing. Third, the main fisheries are tending for bottom fish, a gear which lends itself for trawl gear for herring and salmon. The obstruction and debris encountered by Sheldons Island fishermen included pieces of equipment, pipes, anchors, pipelines, wellheads, and holes in the sea floor. Mr. Goodland estimated that Sheldons Island fishermen lost 5.6 million pounds starting at a result of gas and debris and subsequent loss. The damage claim was high ($275,750) but declined as fisheries developed in remote areas with sea floor obstructions. The fishermen claimed that 1 was difficult to remove debris unless they could recover the obstruction and a company's name was on the debris.

The DOI's proposed appraisal required to an estimated one incident per year. Considering that lease related activities may also place sea floor obstructions in support bases, rig access areas, and other templates, the potential impact to fishermen from oil related activities may not be as significant as the NOI report estimates. The potential impact to fishermen from oil related activities may be less significant than the NOI report estimates.

2. Other Effects

a. Infrastructure and Service-Support conflicts

If commercially exploitable oil and gas fields are discovered and developed in the area, it is likely that there would be a major survey rather than "minor" survey. The services required for offshore platform construction, including submerged pipelines, 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 North Sea, Bering Sea, or Norton Basin. There are several reasons why conflicts would likely be "minor".

First, during the period of oil development in the North Sea the fishing industry in the Sheldons Islands (and the Norton Basin) was apparently impacted by competition with oil. In the late 1970s and early 1980s, the industry during the development and production phases. During the development and production phases, long delays and lost fishing time waiting to get work done on their vessels 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 ports even in close proximity to the lease area in the Bering Sea.
appear to be very limited. The only currently suitable deep water locations are in Dutch Harbor, Kodiak, and an area west of Dutch Harbor. Access to these areas is controlled by the federal government and the presence of native subsistence fisheries would limit the ability of the oil industry to develop these areas.

3. Competition for Labor (Page IV-P-96)

4. Alteration of Fish Behavior

Fish behavior is known to be altered by oil spills and other anthropogenic activities. The potential impact of seismic surveys on fish behavior has been studied, with some research suggesting that seismic waves can cause stress in fish populations.

5. Conclusion

The identification and mitigation of these impacts is crucial for the sustainable development of the oil and gas industry in the region. "The main conclusion is that the potential impact of seismic surveys on fish behavior is minimal and can be managed through appropriate mitigation measures."
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 'insignificant' to 'moderate.'
b. Potential impacts from infrastructure, service, and support should be changed from 'insignificant' 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 cases 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.
1-66. The assumed drilling fluid dilution rate of 1-67. The brief duration of discharge allowed to in
1-68. The dissolved oil concentrations documented 10 kilometers
1-69. The factual basis for the statement that 100,000 barrel
1-70. The egg and/or larval stages of herring, yellowfin
1-71. Even an oilspill of 100,000 barrels which spread to cover
1-72. The reader is left wondering what would be the actual
1-73. Based on estimates of pelagic hydrocarbon concen-
1-74. In the summary section it is stated that, "Diluted
discharge of drilling fluids, cuttings, and formation
1-75. The fact that herring eggs exposed to 1 ppm of
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 for herring, salmon, and salmon smolts. "Moderate" to "major" effects are protected for groundfish (IV-B-28), crab and other invertebrates (IV-B-33), marine birds (IV-B-39), and so on for other groups of organisms. If a major spill were to occur, the conclusions for each of these groups of organisms is the "overall...effects will be MINOR (or MODERATE)." The 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 species. Since spills do not occur from predetermined offshore locations, this type of analysis and reasoning makes 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 concentra-
tions 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 source 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 Council of Port Heiden
strongly urges the U.S. Department of Interior
(Mineral Management Service) to cancel North Aleutian
Basin OCS Sale #1 and defer any future sales in the
area for at least ten (10) years.

[Signature]

Attested by Clerk

THIS RESOLUTION WAS PROPERLY ADOPTED THIS 8th day of
September, 1985 by the authorized membership of the City Council of
Port Heiden, In Port Heiden, Alaska.
RESOLUTION 85-20

WHEREAS, the U.S. Department of Interior has scheduled an oil and gas lease sale in the North Alaskan 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, questions remain unanswered concerning the potential impact of oil and gas development on the vegetation 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 Alaskan Basin;

NOW THEREFORE BE IT RESOLVED that the City Council of Port Heiden strongly urge the U.S. Department of Interior (Minerals Management Service) to cancel North Alaskan Basin OCS Sale #2 and defer any future sales in the area for at least ten (10) years.

SIGNED BY CLAY

City of Port Heiden

This resolution has been properly adopted this day of 1985 by the authorized membership of the City Council of Port Heiden, in Port Heiden, Alaska.
A Resolution Relating the North Aleknagik Basin (Bristol Bay) OCS Lease Sale.

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 few major industry sectors that provide a stable source of income for the region’s residents;

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

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

WHEREAS, the State of Alaska has recognized, through its own planning process, that there are significant gaps in resource information for the North Aleknagik Basin; and

WHEREAS, the state of Alaska has recognized, through its own planning process, that there are significant gaps in resource information for the North Aleknagik Basin;

NOW THEREFORE BE IT RESOLVED that the City Council of Aleknagik, Alaska urges the Secretary of Interior to remove North Aleknagik Basin OCS leasing until at least 1989, from the current OCS leasing schedule until at least 1989.

APPROVED AND ADOPTED THIS 12th DAY OF FEBRUARY, 1983.

[Signatures]

[Seal]
February 4, 1985

Mr. Ed funky
Office of Management & Budget
Division of Governmental Coordination
Juneau, Alaska 99802

Subject: North Aleutian Basin (Bristol Bay) OIL Lease Sale

Dear Mr. Funky:

I am as a Commercial Fishing employee urge you 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,

Richard J. Damb
President

Enclosures

copies: Honorable Governor Sheffield
Senator Ted Staszcuk
Representative Don Young
 nominee Resources policy area board

OFFICE OF
MANAGEMENT & BUDGET
FEB 20 1985
GOVERNMENTAL
COORDINATION
TOGIAK CITY COUNCIL
Resolution No. 95-02

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 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 sales;

NOW THEREFORE BE IT RESOLVED that the Togiax City Council of

urges the Secretary of Interior to

remove North Aleutian Basin Sale #93 from the current OCS leasing schedule until at least 1994.

Emma Ayugak-Cain
"Mayor"

ATTEST:

Dwanna T. Sleighard

OFFICE OF
MANAGEMENT & BUDGET

FEB 11 1985

GOVERNMENTAL COORDINATION

Pedro Bay Village Council Resolution *95-01

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 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 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 (Offshore Management Service) to remove 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
Vice-President, Iona Togiax
Secretary, Ruth Andrew
Treasurer, Norman Jack
Hampers, Elaine Asher

ATTEST, Village Administrator, Barbara Jacko

OFFICE OF
MANAGEMENT & BUDGET

FEB 2 1985

GOVERNMENTAL COORDINATION
Introduction

The State of Alaska's comments on the North Aleutian Basin (Sale 92) OCS lease sale will be specific, remarks that the state's concerns were identified in eight enclosures that addressed the State's information needs. (1) mitigation measures, (2) fisheries harvest, (3) areas of primary concern, (4) a critique of EIS effects assessment, (6) commercial fisheries specific-page comments, and (8) the Aleutians East CSHA's comments. The Aleutians East CSHA submitted comments to the MMS that were identical to Enclosure 8 of the State of Alaska's letter. As a result 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 CSHA are addressed in the comments 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 FEIS directly to the MMS, the (duplicate) copies submitted by the state are not included in Section V. Comments submitted by the NRDC, UFA, and BCRSA are addressed in Response 1-1a, 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.

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 implementation of oil-spill responses and cleanup operations is included in the EIS (Sec. IV.A.4.e.).

Response 1-1c

The MMS does not agree with the comment 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 instance.

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 EIS.

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 1-33 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 commenter, 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 affects 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 $6.5 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 O.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. The MMS responded by preparing a paper that summarized the available information on all of the species and habitats pertaining to fisheries that were visited by these two groups. Both the state and the UPA were provided with this information and were invited to participate and critique the MMS paper and provide their own versions. The MMS revised its version and added the information provided by 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 EIS (specific concerns are addressed in Response 1-13). All points raised by the state and the UPA 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 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 is 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 these; in fact it recognizes these. 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 not feasible 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 directed to the broad nature of the decision itself. That decision is a wholistic 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 decision-maker needs to know whether broad regional and population-wide effects are associated with his choice. The method of analysis provides him with 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 all 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 areas, 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-sale EIS's. The mean case is much more likely to occur than the maximum case. See also Responses 1-3. Other concerning issues identified in this issue and addressed in Responses 1-4a, 1-4b, 1-5, 1-15, 1-16, 1-18, 1-48, 1-49, 1-113, 1-114, and 29-10.

Response 1-1h

This concern is addressed in Response 1-1a.

Response 1-1i

The concerns regarding the analysis of effects on the commercial fishing industry are addressed in Responses 1-44 through 1-58.

Response 1-1j

Drilling masts 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 neither cuttings nor drilling muds would be discharged through effluent discharges, the EIS does not consider exploration discharges to be a significant problem. The quantities of production-derived muds and cuttings 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.

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 more conservative approach by assuming contact of hydrocarbons and egg 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 pelagic 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 chemoreceptive reproductive behavior in females 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 habitats to juvenile red king crabs. Although specific areas of the rocky-cobble habitat have not been identified in the areas adjacent to the North Atlantic Basin lease sale area, sufficient protection from effects is provided from historically support the North Sea red king crab population. Considering the great (historical) abundance of this resource, it can be argued that an extensive 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 subsequent effects on recruitment, which—in combination with adult and egg mortality—will 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/fish/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 impact of 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 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 behavior would not be expected from an offshore oil spill. A nearshore pipeline spill in the vicinity of Port Moller would affect concentrations of hydrocarbons near the mouth of spawning streams around Harensen 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 5 miles) from areas of commercial salmon fishing and would have no effect on the harvesting. The vast majority of the salmonery 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 into 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 offshore lifestages are concentrated in nearshore areas that are contacted by oil spills. 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-spool effects on the regional herring population.

Response 1-9

Information on spawning substrates (Fucus, Zostera) used by herring is included in the distribution of oil spills 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 coarser-grained sediments preferred for capelin spawning would percolate into the water column, would have no effect on the harvesting. The vast majority of the capelinery is within 3 miles of the coastline.

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 to 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/OCEAP 1986 study is summarized in Section III.B.1. and incorporated in the analysis of the EIS (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 hydrocarbon releases, e.g., leaks, on habitats of the species and potential effects on bird populations, the analysis conservatively assumes that (1) hydrocarbons contaminate these habitats while they are concentrated in specific areas, (2) contact results in mortality, and (3) contamination of spawning substrates results in persistence and long-term impacts of species' presence 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 bird disturbance by helicopter overflights (approximately 30-50% of Iseabek Lagoon this past fall). This latter problem was partially resolved through agreement (between refuge personnel and the leasee's flight-service subcontractors) of pilots to fly around the southern edge of the lagoon when weather conditions were VR (visual flight rules), thereby avoiding the most heavily used bird-favoring areas. Such an amendment is necessary to recommendations for avoiding wildlife disturbed by the MMS in the proposed Information to leassees in the Iseabek region (Mammal Protection) that, if for aircraft to maintain at least 300 feet (horizontal distance) from birds and mammals concentrations or known concentration areas. Such mitigations would alleviate the bird/helicopter problem, especially if the swans 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 be feasible for this study of the problem. Fortunately, this corridor traverses an area of less than 10% of the population and could be significant disturbance of the population probably would not occur.

Specific information resulting from observations made during the fall migration period at Iseabek Lagoon is incorporated in the current season (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, view of the current density in several geese populations and 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 PWS.

Response 1-17
Brant, the most sensitive of the species breeding in Iseabek 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 as important or essential as that the Secretary must obtain 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 sites 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 CENRC, a formal "worst-case" analysis is not warranted. Nevertheless, the RIS candidly admits that possible effects on the brant may range from moderate to major.

Response 1-18
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, Ewing (1980) provides information on winter bird densities in this area which, together with oil-splill-trajectory and risk information, allows credible conclusions to be drawn (Sec. IV.B.1.a.(21) of the FEIS). 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 areas in winter. Thus, with the relative 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 grey whale in the vicinity of (Sec. IV.B.1.e.(A) 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.D.). The Secretary of the Interior has set his opinion on alternative to delay or delete those 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 North Pacific grey whale population.

Response 1-19

Adequate information on the abundance and distribution of sea otters along the northern side of the Alaska Peninsula and Unalaska Island is available to assess the potential effects of oil and gas activities (Sec. IV.B.1.e.(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 600 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/km² (Schnei- der, 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, fit, and low abundance," as did Schneider (1976), but they reported a high estimate of the total population in the lease area of 15,000 to 20,000, while Schonter (1976) estimated the population at 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-km² 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 northern sea otters from the Alaska Peninsula could replace lost individuals within less than one generation. The EIS case study 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 elaggrass (Zostera marina) (Sec. IV.B.1.c.(i) of the FES) and the effects of seaweed (Chondrus crispus) reduced by exposure to hydrocarbons, and recovery of seaweed 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.6. 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 BMS has jurisdiction and enforcement authority. The archeological and historical sites delineated by the Aleutian East OCS 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 IZL on Coastal Zone Management has been revised to include the following: "Leaseses are advised that the draft Aleutian 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 IZL 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 lessor and the lessee 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 EIS does include an IZL for consultation with the Bering Sea Biological Task Force (1979) 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)(13)(B) of the Coastal Zone Management Act (CZMA). Because the CZMA provides the state and the Coastal Alasks with the authority to review industry plans through the consistency-review process, the PHS feels that it is inappropriate to include a statement in the regulation indicating that the Regional Supervisor, Field Operations (RSFO), should consult with the Aleutians East CRA regarding any proposed pipelines. The IIT 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 IIT 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 IIT: "The State of Alaska has advised the PHS that it will review the lessee's consistency certification accompanying oil-spill-contingency plans specifically for consistency with the State's CZP. The State may not concur with the lessee's plans for exploration, development, and production under Section 307(c)(13) 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/water 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."

Response 1-28

The IIT on Areas of Special Biological Sensitivity has been amended to include Atka Island and Sea Lion Rocks as Areas of Special Biological Sensitivity. State designations for the Naitina Islands and Cape Newkanus have been corrected in the IIT.

Response 1-29

The IIT 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 IIT on the Bering Sea Biological Task Force: "Before making recommendations to the RSFO, the Bering Sea BIF 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 IIT 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 IIT on Areas of Special Biological Sensitivity has been amended to include Moffett Lagoon, Big Lagoon, Hook Bay, St. Catherine's Cove, and Banana Lagoon. The PHS feels that it is inappropriate to include the aircraft policies of the draft Aleutians East CRA Coastal Management Program in the IIT.

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 enforcement policies of the State Coastal Management Program.
pursuant to Section 307(c)(3)(B) of the Coastal Zone Management Act. The IUL on Coastal Zone Management provides that the Regional Supervisor, Field Alaska Coastal Management Program and the consistency-review phase.

Responses 1-32

The stipulation presented is the Navarin Basin Notice of Sale 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 V1 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.

Responses 1-33

The present IUL, 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 IUL and the OIL/Fisheries Group of Alaska provide the leases 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 NMFS believes that the industry is 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 NMFS 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 geological 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 Alaska Coastal Management Program and the consistency-review phase.

Responses 1-34

An IUL on Oil-Spill-Contingency Plans has been added to the FES.

The proposed IUL is similar to the IUL found in the Notice of Sale for Morton Sound (Sale 57), Navarin Basin (Sale 83), and St. George Basin (Sales 70 and 89).

Responses 1-35

The text has been amended to reflect this concern (see Sec. III.B.2.1.)

Responses 1-36

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

Responses 1-37

The text has been amended (Sec. III.C.1.c.(4)) 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 fishery, a species of greater economic value. The Atlantic Ocean and Bering Sea capelin fisheries are operative due, in part, to leaner or nonexistent herring fisheries for herring.

Responses 1-38

The importance of the southeastern Bering Sea as a resting 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.(3)) 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.

Responses 1-39

According to the International Pacific Halibut Commission (O. McGaughen, 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 all of the proposed lease sale area and all large segments of the Bering Sea and Gulf of Alaska, was 544 metric tons (1,200,000 lb) (Pacific Halibut Fishery Regulations, 1983). The text has been amended (Sec. III.B.1.1) to indicate that Bering Sea halibut populations are of sufficient size to support a commercial fishery.

Response 1-40

The Aleutian term 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., 1984), rather than 50 percent, as suggested in comments received from the State of Alaska. This colony is clearly indicated on Graph 2, noted in the text revision of Section III.B.2 (Marine and Coastal Birds), and discussed in Section IV.B.1.4.2 (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.1.3) summarizes the available life-history information on red king crab, but does not intend to suggest that the nearshore population dynamics of...-...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 life stages of red king crab would be concentrated in the nearshore areas and would be contacted by a 100,000-barrel oil spill (see Sec. IV.B.1.4.1).

Response 1-42

As stated in the text, "hakes migrating through the St. George Basin pass in a broad front across the shelf from Huntvak Island to Unalaska Pass." Indicates that the southerly 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, 1964)."

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 scientists, 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 1 of Section IV.B.1.4.1 (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 area. If a specific region (i.e., Bering Sea coastal habitats, Unalaska 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 1-16.

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 lease 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 60 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 one spill of 3,000 barrels or greater will occur over the 12-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 one 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 may not be considered in the analysis.

The maximum case (759 MWe) 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 EIS (Sec. IV.B.2.1).

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 tsunami. Tsunamis heights at sea are negligible—only when a tsunami near shoreline would its height possibly increase to 30 meters. Thus, tsunami would pose a risk to shore facilities but not to at-sea pipelines, tanker terminals, or offshore 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 1-49.

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 465 miles of high-resolution surveys 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 clearance at 12 locations, and 465 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 postlease activities. For this purpose, 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 Response 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 incidence records occurred elsewhere was analyzed, and a comparison of platform numbers and pipeline miles was used to reach this conclusion. Seismic surveys were used to arrive at these numbers. Support bases, rig-storage areas, and tanker terminals (inshore only on minimal areas) in any case, these oil-industry facilities may be readily situated outside fishing areas. To date, limited exploration in the St. George and Newarin Basins has posed no conflicts with, or problems for, the commercial fishing industry in these areas.

Response 1-55

Based on current operations at the Alaska and Gulf Bay, this competition has not materialized. 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 is 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/behalor without lasting effect to either the organisms 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.

Response 1-58

The DOS 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 Cenrour Associates, 1983):
- Trawl gear 0 - 1.5 miles annually
- Grab-pot gear 120 annually
- Longline gear 2 - 4 poles annually
- Gillnet/purse-seine gear No effect

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

The projected 1,342 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 cooperation, can readily operate outside the pot fisheries.

In part, these overall conclusions are based on Ingram et al. (1962), Centaur Associates, Inc., and Dames and Moore (1982). The NGO cannot agree that undocumented "feasible scenarios, past experience, and analogous case histories" merit revision of this conclusion.

Response 1-59

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

Response 1-60

Nyasals (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, nyasals 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 TV-3 has been revised to indicate the source of drilling effluents.

Response 1-63

Table TV-3 has been revised to include the quantity and time interval for disposal of production-phase drilling muds.

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

Response 1-64

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

Response 1-65

As referenced in the DEIS, the assumed drilling-fluid dilution rate of 10,000:1 at 100 meters was taken from a study by James and Moore (Noughton et al., 1980), and from two papers in a 1980 symposium on the fate and effects of drilling fluids (Ayers et al., 1990a, 1990b). The text has been clarified to reflect the lack of a dispersion study specific to the North Aleutian Basin.

Response 1-66

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

Response 1-67

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

Response 1-68

The basis for assuming that an oil spill of 100,000 barrels will spread to cover 200 km² in the North Aleutian Basin is discussed in Section IV.A.3.d. ( Fate and Behavior of Spilled Oil) of the FEIS.

Response 1-69

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 Hoeha, 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
dispelled oil in this area would be 1 year (Proceedings of a
SYDNEE Meeting: The Alaskan Shelf Environment and
Possible Consequences of Offshore Oil and Gas Development,
Anchorage, Alaska, March 9-11, 1983).

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 (0.02 ppb)
over an area of 407 km²; however, quantities that sink to the
beaches would be much smaller in area and affect a smaller
habitat, e.g., estuaries or estuarine areas. Even with large
ecosystems, the affected area would be only a small
fraction of the total.

Response 1-72
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 tempera-
ture, 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 life-
forms during the oil spill is assumed.

Response 1-73
The discussion of potential effects on salmon in the Port Moller
area (Sec. IV.B.1.a.(1)(b), Paragraph 14, of the OESJ) 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 life stages:
“effects of an oil spill contacting nearshore areas within 3 days
while hydrocarbon concentrations are relatively high could include
mortality . . . 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 1-74
Because the discussion in Section IV.B.1.e.(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 “oceans does not experience lethal quantities,” it is
impossible to consider the effects of low-oil hydro-
concentrations (i.e., 96-hr LC10).

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 impacts a
certain area, the analysis of effects on the resources inhabiting
that area are not discussed in detail.
February 25, 1985

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. Robert Turner of your office who has corrected the address. Subsequent communications from your office should reach us and be reviewed within a timely fashion.

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 the cultural resources and potential impacts of on-shore activities resulting from a site. We suggest that the last paragraph of Section 7.3 (page 149-51) be amended to the DEIS where Section 7.3 (page 149-51) that addresses only potential effect, but probable measures for protection of these on-shore resources should be included.

We understand that the DEIS represents an early planning stage for the potential of oil and gas leases and that NEPA does not necessarily control the locations or types of on-shore facilities. However, facility locations and transportation routes are described in the DEIS and would in all probability be very similar to those actually proposed as a result of any leases sold. Therefore, NEPA should control, under the applicable regulations, the selection of locations and routes. If such regulations are not currently being amended, a description of potentially affected on-shore cultural resources. We should also propose mitigation measures for those cultural resources which may be on or eligible for the National Register of Historic Places.

Sincerely,

Neil C. Johnson
Environmental Officer

6120-9-6
3450 0980

Subject: DEIS North Alaskan Basin Sale 92

Thomas R. Boyd
EIS Coordinator

Plains Management Service
P.O. Box 101159
Anchorage, Alaska 99510

Dear Mr. Boyd:

We take this opportunity to remind you that many of the World War II facilities in the area have been determined eligible for the National Register. This fact must also be incorporated into your DEIS.

In summary, the DEIS uses a long term toward cultural resources. We need to address on-shore facility and protection of onshore cultural resources. We join the council in offering our assistance with these concerns. Please feel free to contact us at your convenience (360-4141).

Sincerely,

Judith R. Brown
State Historic Preservation Officer

6120-9-6
3450 0980

February 25, 1985

Page 2

We have reviewed this document and believe that it contains adequate information concerning the potential effects on cultural resources. However, we would like to see more specific information regarding the proposed activities onshore.

Sincerely,

Neil C. Johnson
Environmental Officer
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 Area 92 area, have been provided in the text (Sec. IV.F.1. of the FEIS). The detailed description of each site and its location is provided by the State Historic Resources File (see Appendix J, Table 3-1), 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 Area 92 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 Portioning Corps of Engineers Environmental Assessment 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.
6 March 1985

Mr. James Hotel, Secretary
Department of the Interior
E Street, between 15th and 19th Streets, N.W.
Washington, D.C. 20240

Dear Secretary Hotel,

As Representative of District 25 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 Atlantic Shelf Federal oil and gas lease sale.

I have reviewed the Draft Environmental Impact Statement (DEIS) prepared by the Minerals Management Service (MMS) for sale of tracts under the Federal the Five-Year OCS Leasing Schedule. As you know, the State of Alaska is officially opposed to this lease sale and I wholeheartedly support this position.

I wish to stress the concerns I have about the proposed North Atlantic Sale 25 are not based on blanket opposition to all 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 workers directly and indirectly 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 resource of Bristol Bay. Although a great deal of effort has been made 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 relative to the impact of oil and gas development and life cycle needs of salmon, herring, chum and king trout. In general, the DEIS fails to analyze adequately the biological resources of Bristol Bay.

I am particularly disturbed that the DEIS fails to address meaningfully the consequences of oil spills 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 local or regional fishing which, in turn, could impact subsistence and commercial fishermen and/or groundfish stocks 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.

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 (BAPA). This plan generally simulates a moratorium on the leasing of lands until at least 1996. The first BAPA was the product of a lengthy public process involving the general public and local governments as well as the federal agencies. This 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 and federal governments. It is also appropriate for the Federal OCS as well.

It is important to note that BAPA identifies several areas along the Bristol Bay coastline as containing essential habitats for fish and wildlife. Bristol Bay is the most productive and complex of the Bristol Bay and Copper River areas. The moratorium at this time is intended to protect the area from oil and gas development. The moratorium does not extend to any existing facilities or any activities carried out under the authority of the National Marine Sanctuary Act which authorizes research and observation activities in the sanctuary areas.

The proposed Federal sale has great potential to directly impact these crucial habitat areas, particularly those along the southern end of the Alaska Peninsula closer to the Federal sale area. I fear that if the moratorium is lifted, the Bristol Bay area could become the next area in the nation to experience oil and gas development. I believe that development would result in at least one spill of greater than 1,000 barrels and that the chance of such an incident is real.

I truly hope that the DEIS will be reexamined and the proposed Federal sale will be reevaluated.

Sincerely,

[Signature]

Chairman, House of Representatives
split. Impacting Port Moller was virtually certain, i.e., 100%. Further, it is generally acknowledged that, without the oil split response technology is inadequate to contain or clean up an oil spill in the states that are covered in the area of the split.

In contrast to the enormous biological values, the estimated hydrocarbon resources of the area are insignificant. The BPA reports an estimated value of 564 million barrels. This is less than one-tenth of the oil in the Bristol Bay area. The highest number of barrels of oil that have ever been recovered, and which is sufficient to estimate the oil split's potential, the Bristol Bay area represents only 5% of Alaska's petroleum, as estimated by the National Petroleum Council.

In response to the argument that there is a national interest as 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 new different research of the Bristol Bay area is performed, the economic advantage may simply not have sense to justify the enormous exposure to the environmental risks of the area for a few more days of oil, there are other, less vulnerable areas both on shore and offshore to explore for and develop hydrocarbon resources.

Again, I ask that the federal government reconsider its intention to proceed with Safe 10 and to defer this proposed sale indefinitely.

Sincerely,

[Signature]

S. Adelheidx Sorenson
Representative District 29
oil: Alan Powers, and

Response 1

The 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 5% to 2-percentage occurrence-contact risk for virtually all nearshore fishing areas east of Port Moller and into Bristol Bay, and the occurrence-contact risk is up to 15% percent from Port Moller west but not beyond the north Alaska Peninsula area north of Point Barrow. 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. 17.0.1.4.).

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 Alaskan Basin.

Response 2

The probability of 1 or more spills of 1,000 barrels or greater occurring as a result of Alternative I is 63 percent. However, forAlternative I, the probability of 1 or more spills of at least 1,000 barrels contacting the shorelines 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 commenter is a conditional probability that, subsequent to a spill has occurred at Launch Point D1 (a specific hypothetical launch point within 30 km of Port Moller), the spill would contact offshore waters within 50 kilometers of Port Moller.

Further discussion of oil-split response capability in the open ocean has been added to the text (Sec. IV.A.4. of the EIS).
March 12, 1985

Mr. Alan Powers
Alaska OCS Region
Minerals Management Service
P.O. Box 18159
Anchorage, Alaska 99510


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 1986. This will assure that the data gaps identified by the State are adequately address-
ed. The industry catch up with oil spill cleanup and con-
tamination and transmission technology; and the Board affords the opportunity to complete the Aleutians East CSHA public hearing draft coastal management plan. In Section E of the General Comments section, 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 CHP.

The rising of the lease sale in relation to the Aleutians East CSHA program is unfortunate. The Aleutians East CSHA does not have an approved program. The Board has been unable 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 CSHA. If a hydroconson resource is found in the Aleutians East CSHA, activities using the approved Aleutians East Plan as a guide, in coordination with the Board, has thoroughly reviewed the North Aleu-
tian 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 CSHA 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
Chairman Aleutians East CSHA Board

cc: CSHA Board
    Nelson Lagoon Village Council
    BSSHA Board
    City of Sand Point
    City of King Cove
    City of Cold Bay
    False Pass Village Council

Att: 1. Aleutians East CSHA draft CHP Policies
    II. Special Use Area, Resource Values and Concerns
PART I
GENERAL COMMENTS

A. Resource Documentation

1. Fishery Data Gaps

In general the documentation of natural resources is inconsistent. The NEIL'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 areas. 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.
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 migrations; 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; (i) during spawning in near-shore waters; and (ii) 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 fishery as in Unalaska and Atka Bay and the two-three ton sac roe fishery in Port Moller/Baranof Bay.

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

4) Impact of an oil spill on all life stages of herring.

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

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

2) The distribution and abundance of larval, juvenile and adult capelin, and the delineation of near-shore 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 larvae 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. Ongoing Studies

The NPS has ordered 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.

4-1b

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 Community. A special use area in the public hearing draft the Aleutians East Board identified five special use areas relevant to the North Aleutian Shelf Lease Area.

1. Port Moller/Baranof Bay
2. Neilson Lagoon
3. Iliamna Lagoon Special Use Area
4. Becharof Bay Special Use Area
5. Unimak Pass Special Use Area

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 attached. The Board has chosen to highlight the special use areas 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 impact section of the analysis, which the Aleutians East Special Use Area policies need to be applied to the lease sale stipulations or I_TE's to assure that these areas remain commercially productive and that fishing opportunities continue without interference. (See Section E on proposed stipulations)

3. Impacts of Oil and Gas Development

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 14-54%. 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% of Port Moller, the Bay of Petrel and the impacts from the proposed oil spill, the impacts section has the following problems:

1. The DEIS underestimates 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:

NOTE: This probability assumes a low potential to risk an economic resource. At the Anchorage hearing February 25, 1981, Mr. Peter Hanley with Sohio Alaska commented that the potential risk assessment of the likelihood for an economic resource is low.
b) The analysis does not take into consideration that the lease sale area and Alaska Peninsula is an active seismic zone.

c) The analysis underestimates the extent of a potential spill and the toxic effect of hydrocarbons on fish eggs and larvae, subtidal effects of hydrocarbons, and the effect of hydrocarbons on benthic communities.

2. The rate of degradation of spilled oil only applies to the lease sale area which is out at sea. If a economical resource in the pipeline to Port Moller/Bernard Bay and across the Alaska Peninsula to Balsbaw Bay. Table 5 in the DEIS identifies that if a spill of 2,700 barrels or greater occurs in the lease sale area, there is a conditional probability of 99.5% for oil to contact Port Moller. While this risk assumption is likely for oil and gas to contact the Port Moller/Bernard Bay area it fails to assess the far and duration of spilled oil in Port Moller due to tidal action.

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

4. Major impacts are identified as local and not affecting the Bering Sea regional resource populations. However, the actual impact of a spill is dependent on the time of year and weather conditions. The effect of a major spill 150,000 bbl oil spill covering 200 sq. kilometers on localized area could affect the entire basin because of temporal and spatial segregation of stocks. For instance, a spill in the Bering Sea could concentrate a 20 sq. mile slick along the B. Peninsula coast where larval king, herring, pollock and juvenile salmon concentrations are high.

5. While there is some indication of the eventual fate of the spilled oil in the nearshore environments the DEIS does not specify specific impacts on. For the full magnitude of a spill on the local area's resources. For example, the impact locally to the Salan Leppoon fishery could be very significant, while the transshipment fishery is not significant to the Bristol Bay fishery as a whole.

6. There is not a discussion on oil spill response capacities in the North Atlantic Shelf Basin.

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

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

a) fails to provide an analysis of the effect of a spill into Port Moller/Bernard Bay resulting from a ruptured pipeline or supply boat.

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

c) fails to adequately discuss transshipment difficulties for Balsbaw Bay. Examples of some difficulties are:

1) loading of large crude carriers would have to be conducted well out in the bay. 2) the cruise ship length of a VLCC ship of 295,000 DWT or larger is nearly 5 kilometers, 1.7 miles, at 15 knots.

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

In the second case where oil is transshipped from the rig through Oilmak Pass the analysis underestimates potential impact. Particularly in light of the fact that Oilmak Pass has been identified in the DEIS as the possible passage route for the Bearin, St. George, Morton and possibly Canadian Beaufort Lease Sales. (page 74-75)

The AOGA comments at the Anchorage Public Hearing recommended that the PNT analysis should emphasize the use of super-tankers to ship the crude directly - market. If the industry is supporting offshore loading then the State and Arctic East region need to reevaluate the conclusions of the AOGA comments with respect to local economy and the DEIS analysis needs to analyze this option more fully.

E. Other miscellaneous impact related concerns.

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

Y. 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, wave in the Bering Sea are 20-25'.
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 or not the existing compensation program is adequate to cover potential claims and whether fishermen in other parts of the country (i.e. California) are satisfied with the results they are receiving.

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 operation has occurred in the Aleutians East area, and the Board is aware of the complaints registered by fishermen operating in the Shelikof Straits and Cook Inlet. The Board understands that the DEIS undermines the trackline miles which may be used by the seismic operator is likely to be at least a "moderate" problem rather than a "minor" as supposed by 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 CBA board following the policies as proposed in the Draft Aleutians East CBA Coastal Management Plan.

The Aleutians East CHP public hearing draft is currently available for review. The DEIS needs to be reviewed to reflect the plan policies and special use areas. The timing of the lease sales in the Aleutians East CHP program is important. The earliest the Aleutians East CHP 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 CHP 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 CESA was to establish a vehicle 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 Bering Sea and California and provides guidelines under which the Board
feels oil and gas development is acceptable. Because of
unfortunate timing, the DEIS has inadvertently 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 plans for the ILT's. Below are relevant Board policies that
are consistent with the proposed stipulations. In some instances the
full content of the Board policies or a particular policy is not
addressed, however, the Board's plan is not to address issues
before the stipulations are approved. The stipulations 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

Description of commercial fishery should also include de-
tailed maps, up-to-date fishing and seasons for the
commercial fisheries. The maps should also include a
presentation on major mitigative measures to be implemented
for the project including sensitive taking restrictions and
sensitive resource areas.

4-22

3) Stipulation #3: Protection of Biological Resources

Consider Aleutians East draft CHP Energy Facilities, Trans-
portation and Utilities and Coastal Development Policies.

Consider Aleutians East draft CHP Fish and Wildlife poli-
cies 1-3 through A-9, (attached), and Special Use Area
policies for:

a) (3) Port Robb/Herendeen Bay/Dear River Special Use Area
b) (9) Belison Lagoon Special Use Area
c) (11) Iseeman Lagoon Special Use Area
d) (6) Becharisk Bay Special Use Area

e) (G) 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 #5-14 of Special Biological
Sensitivity ITL should be incorporated into Stipulation #2 to
protect areas important for fishery habitat as identified
in the Aleutians East CHP are highlighted and
mitigated. The areas should be identified and designed to reduce
possible effects of oil and gas development.

4-23

4) Stipulation #4: Wellhead and Pipeline Requirements

Consider Aleutians East draft CHP Energy Facilities
Policies G-4, G-5, G-6, G-7, and G-8; and Transportation

4-24

b) Proposal that suggests that "all pipelines, unless
buried, including gathering line, shall have a smooth
surface design". p. 11-C-7, should be implemented.

c) The Aleutians East Board will strongly support burial
of pipelines in high use commercial fishing areas, see
draft CHP policy G-4.

5) Stipulation #5: Transportation of Hydrocarbons

Consider Aleutians East draft CHP Energy Facilities, Trans-
portation and Utilities and Coastal Development Policies.

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 Aleu-
tians Region. The Board recommends that the DOI review the

policies to ensure the policies develop language which
Aleutians East draft CHP energy facilities policies develop language which
prescribes specific mitigative measures and incorporate the
language as enforceable into the mitigation measures resulting
from the lease. The Board will notify the MMS immediately of any changes
made to the aforementioned policies in the approval process.

4-25
PART II

DETAILED COMMENTS ON THE NORTH ALASKAN OFFSHORE LEASE SALE

1. p.3-26 Identification of pipeline is inconsistent with MMS technical report #10 page 3-21 which placed limit on length of marine and overland pipeline due to oil spill. (see point #9 below)

2. Table 6-1: Impact on commercial fishing: MMS identifies minor impact on commercial fishing industry, the actual impact on commercial resources may be considerably greater. The estimated effect is underestimated for at least two reasons: I) extent of area a spill could cover is smaller than should be; and 2) toxic effects of oil persist for more than 16 days - up to 6 months especially in arctic waters.

3. Table 8-1: Impact on Community Infrastructure: If a commercial resource is found impacts likely will be greater than 'negligible'.

4. Table 8-1 note 1: Effects on Unitar vessel traffic would not be 'minor' if offshore loading is used for transshipment to final destination. Effects on Unitar could be substantial if other lease sale areas in the Bering Sea are released under production.

5. p. 1-02-3 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 gap response documents this.) This information is needed to adequately determine impacts in nearshore resources on both the North and South sides of the Peninsula.


7. p. 1-02-5 3(a) Gravel extraction from anomalous fish streams. MMS identifies a causeway in Herendeen Bay on page IV-27 which will likely be affected from fish streams to build the causeway if that is all that is available. The public hearing on the Plan currently prohibits gravel mining in major streams of Special Use Areas. Herendeen Bay is identified as a Special Use Area. (item 6 page IV-27 public hearing draft CHP).

8. p. 1-02-4 3(b) Oil spill response. The degree of potential impact is highly dependent on the ability to contain and cleanup oil spills (Table 5-1).

9. p. 1-02-4 3(c) Use of explosives for seismic testing. The Aleutians East Board's policy Energy Facilities Geophysical surveys G-1-2 prohibit use of explosives. MMS should ensure there is no seismic use of explosives in inventory because impacts on fisheries is a top priority. The estimated extent of impact on shellfish, water, near shore areas where impact on juvenile salmon could be great if the salmon are concentrated.

10. p. 1-02-5 Alternative IV, Alaska Peninsula Deferral. MMS report #10 indicates that a pipeline greater than 10 miles may be feasible based on properties of crude oil. If this is the case, the alternative and its effects would be inaccurate because offshore loading would be the only means of transferring the oil up to 150 miles out to the offshore tankers. The preferred method in MMS report #10.

11. p. 1-02-5 If commercial quantities of oil and gas are both discovered, two pipelines across the peninsula would result, construction would be either concurrent or staggered.

12. p. 1-02-5 LNG plant and cooling water use could be a concern at Balba Bay.

13. p. 1-02-5 Stipulation No. 2: Protection of Cultural Resources: (include additional language needed) ...including archeological and historical sites delineated in the A.K. Coastal Management Plan.

14. p. 1-02-5 Stipulation No. 3: MMS Cultural Resource survey only covers lease sale areas, not upland corridors for pipeline or port sites.

15. p. 1-02-5 Stipulation No. 4: Orientation Program. The program should also include a presentation on major mitigation measures to be implemented for projects, including sensitive timing restrictions, and sensitive resource areas.

16. p. 1-02-5 Stipulation No. 4: Protection of Biological Resources. Stipulation should identify all Special Use Areas. MMS information/studies for nearshore areas are incomplete or unfinished. Companies should be notified that should areas of special biological importance be identified in these studies their operations may have to be revised. Question: how does this stipulation protect areas such as nearshore areas which are outside of the lease sale area but adjacent to it? (i.e. Port/Herendeen Bay?)

17. p. 1-02-5 Stipulation No. 4: Wellhead and Pipeline Requirements. See A.E. CBHA Policy G-4 Offshore pipelines. G-5 Offshore Stipulation No. 4. The AECBA Board should be included in discussion of where pipelines will be buried. The AECBA will request burial in high use commercial/subsistence fishing areas.

18. p. 1-02-5 Stipulation No. 5: Offshore Stipulation No. 5. Oil and gas pipeline systems. Offshore energy facilities and pipelines are not interpreted as being a part of this stipulation. Offshore energy facilities and pipelines are not interpreted as being a part of this stipulation.
51. p. IV-B-20. In addition to federal and state lease sales 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 devastated.

52. p. IV-B-21. A large shorebreak spill which resulted in higher concentrations of hydrocarbons contacting necessary at lower latitudes. Why is this statement true and what data is it based on? Spawning salmon could return in late June through September.

53. p. IV-B-22. Paragraph two. Although an oil spill... This paragraph is not considering the worst case. Although RMS has identified that there is a low probability for a pipeline breach in Port Holler, if the break were to occur it could be catastrophic as the hydrocarbons would go back and forth with the tide. Again, given certain timing and certain weather conditions the spill could occur during a time which could have a significant effect on an entire speck population.

54. p. IV-B-23. The effects of a potential spill could have an effect on migratory salmon. The analysis suggests delay caused by concentrations of oil at 1 ppm, other studies suggest delay 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 could decrease spawning ability of migrating salmon.

55. Table IV-B-15: Note: table suggests that if a spill of 1,000 barrels or greater occurs in Port Holler, a conditional probability of spill is 70% for oil to contact Port Holler. This is a very high probability.

56. p. IV-B-24. Paragraph two refers to severe local effects, why not just state a moderate to severe local effect is possible? It is not clear why 3 months is specified in the analysis. It is not clear what 3 months represents. Is it a month that is expected to occur once every 3 months? Is it a month that is expected to occur once every 3 years? It is not clear what the analysis means by "expected to occur once every 3 months".

57. p. IV-B-25. Discussion on effect of lease sale area. The analysis fails to discuss the potential for adverse effects of a lease sale area. It is not clear why the analysis fails to consider this potential. It is not clear what the analysis means by "expected to occur once every 3 months".

58. p. IV-B-26. Paragraph one. Although an oil spill... This paragraph is not considering the worst case. Although RMS has identified that there is a low probability for a pipeline breach in Port Holler, if the break were to occur it could be catastrophic as the hydrocarbons would go back and forth with the tide. Again, given certain timing and certain weather conditions the spill could occur during a time which could have a significant effect on an entire speck population.
14. p. IV-9-10 Southern coast of the Alaska Peninsula. Tracts of one site of Port Holme at Elbow Bay. Is needed if proposal to build pipeline is serious.

15. p. IV-9-11 Summary analysis on salmonoids. Agree with analysis of minor overall effects on regional and local populations. Needed if proposal to build pipeline. Support for the AE Aircraft special use permits.


18. p. IV-9-22 Effect on Port Mellor. Important point. Needs to be studied. Port Mellor will be vulnerable to hydrocarbons. Port Mellor is too wide to feasibly remove the oil by booms. In addition, the tidal action would potentially move the oil back and forth several times in the bay. Needed to assess the fate of the oil spill. Need studies in this area.

19. p. IV-9-23 The analysis tends to underestimate the probability of a spill occurring. The analysis tends to underestimate the probability by using "relatively" high. The analysis tends to underestimate the probability of a spill occurring. The planning phase is "certain to continue".


21. p. IV-9-25 Notes: Because the coastal zone along the northern side of the Alaska Peninsula is the major reproductive habitat for red king crab. An oil spill which contacted a shoreline area would have serious impacts on the regional population.

22. p. IV-9-26 Notes: "potential impact on currently depressed red king crab are recognized as major".


24. p. IV-9-28 H. Coast of the Ak Peninsula. Two points regarding oil spill trajectory. i. Frequent occurrence of longshore cur at spill trajectory. j. Distribution of longshore cur at spill trajectory. k. Distribution of longshore cur at spill trajectory. I. Distribution of longshore cur at spill trajectory. J. Distribution of longshore cur at spill trajectory. K. Distribution of longshore cur at spill trajectory. L. Distribution of longshore cur at spill trajectory. M. Distribution of longshore cur at spill trajectory. N. Distribution of longshore cur at spill trajectory. O. Distribution of longshore cur at spill trajectory. P. Distribution of longshore cur at spill trajectory. Q. Distribution of longshore cur at spill trajectory. R. Distribution of longshore cur at spill trajectory. S. Distribution of longshore cur at spill trajectory. T. Distribution of longshore cur at spill trajectory. U. Distribution of longshore cur at spill trajectory. V. Distribution of longshore cur at spill trajectory. W. Distribution of longshore cur at spill trajectory. X. Distribution of longshore cur at spill trajectory. Y. Distribution of longshore cur at spill trajectory. Z. Distribution of longshore cur at spill trajectory.

25. p. IV-9-29 Notes: "potential impact on currently depressed red king crab are recognized as major".

26. p. IV-9-30 Notes: "potential impact on currently depressed red king crab are recognized as major".

27. p. IV-9-31 Notes: "potential impact on currently depressed red king crab are recognized as major".

28. p. IV-9-32 Notes: "potential impact on currently depressed red king crab are recognized as major".

29. p. IV-9-33 Notes: "potential impact on currently depressed red king crab are recognized as major".

30. p. IV-9-34 Notes: "potential impact on currently depressed red king crab are recognized as major".

31. p. IV-9-35 Notes: "potential impact on currently depressed red king crab are recognized as major".

32. p. IV-9-36 Notes: "potential impact on currently depressed red king crab are recognized as major".

33. p. IV-9-37 Notes: "potential impact on currently depressed red king crab are recognized as major".

34. p. IV-9-38 Notes: "potential impact on currently depressed red king crab are recognized as major".

35. p. IV-9-39 Notes: "potential impact on currently depressed red king crab are recognized as major".

36. p. IV-9-40 Notes: "potential impact on currently depressed red king crab are recognized as major".

37. p. IV-9-41 Notes: "potential impact on currently depressed red king crab are recognized as major".

38. p. IV-9-42 Notes: "potential impact on currently depressed red king crab are recognized as major".

39. p. IV-9-43 Notes: "potential impact on currently depressed red king crab are recognized as major".

40. p. IV-9-44 Notes: "potential impact on currently depressed red king crab are recognized as major".

41. p. IV-9-45 Notes: "potential impact on currently depressed red king crab are recognized as major".

42. p. IV-9-46 Notes: "potential impact on currently depressed red king crab are recognized as major".

43. p. IV-9-47 Notes: "potential impact on currently depressed red king crab are recognized as major".

44. p. IV-9-48 Notes: "potential impact on currently depressed red king crab are recognized as major".

45. p. IV-9-49 Notes: "potential impact on currently depressed red king crab are recognized as major".

46. p. IV-9-50 Notes: "potential impact on currently depressed red king crab are recognized as major".

47. p. IV-9-51 Notes: "potential impact on currently depressed red king crab are recognized as major".

48. p. IV-9-52 Notes: "potential impact on currently depressed red king crab are recognized as major".

49. p. IV-9-53 Notes: "potential impact on currently depressed red king crab are recognized as major".

50. p. IV-9-54 Notes: "potential impact on currently depressed red king crab are recognized as major".

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52. p. IV-9-56 Notes: "potential impact on currently depressed red king crab are recognized as major".

53. p. IV-9-57 Notes: "potential impact on currently depressed red king crab are recognized as major".

54. p. IV-9-58 Notes: "potential impact on currently depressed red king crab are recognized as major".

55. p. IV-9-59 Notes: "potential impact on currently depressed red king crab are recognized as major".

56. p. IV-9-60 Notes: "potential impact on currently depressed red king crab are recognized as major".

57. p. IV-9-61 Notes: "potential impact on currently depressed red king crab are recognized as major".
In California similar problems have been identified by California fishermen.

99. p. IV-95-96 Trawler Gear Damage. During the above mentioned conference Mr. Goodlad asked about conflicts between pipelines and trawl gear damage. Discussion revealed that it is not the equipment, but the human element which provided for compensation for damaged gear. The agreement provided that if damage was left at a particular oil company, that oil company will compensate the fishermen for the loss.

If debris is not attributable to a particular oil company, but definitely oil related, claims are submitted to the United States Offshore Operators Association (USOGA) compensation plan. This plan is funded by the oil companies and administered by fishermen appointed by the Oil/Fisheries Work Group. The system is designed to allow quick, immediate, and on-deck, attempts to compensate fishermen for damage to gear and vessels. Lost fishing times, etc. but no matter how good the actual compensation for the full cost of the loss or the inconvenience of an incident.

Another related problem to trawl gear conflicts is more general in nature. 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 M. Sea has been loss of fishing access to fishing grounds on either side of pipelines.

100. p. IV-91-96 Effect on fisheries on E. Coast of S. Periducks. The tanker traffic out of Balboa Bay, analyses is inadequate. Balboa Bay is filled with ships and algae topography are not.

If the Bay is more hazardous than that of Vailes. Tenders need 2.3 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.

101. p. IV-96-96 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?

102. p. IV-8-108 Cold Bay and Yukon. If the pressure on the resource will be minimal did ARCO and EPA consider methods of restricting access to reserves or limiting harvest of trout to minimize population impacts in 1984?

103. p. IV-8-109 Will Sand Point be excluded from any economic benefits from the Balboa Bay (ICG) terminal?

104. p. IV-8-109 First sentence first paragraph. Does this assume that subsistence fishermen would not be deterred from harvesting tainted fish?
<table>
<thead>
<tr>
<th>Page</th>
<th>Text</th>
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</thead>
<tbody>
<tr>
<td>4-145</td>
<td>The analysis needs to recognize the high potential for attracting brown bears to garbage and the need to 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.</td>
</tr>
<tr>
<td>4-146</td>
<td>Local population of brown bears could be significantly affected by well blowout from use of spring forage and fish stream feeding areas. Den abandonment along pipeline corridor and human/bear incidents.</td>
</tr>
<tr>
<td>4-147</td>
<td>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.</td>
</tr>
<tr>
<td>4-148</td>
<td>Marine and coastal birds, unavoidable adverse impacts. Aircraft disturbance can be mitigated with flight path and altitude restrictions, see AE Special Use permits for aircraft flight restrictions.</td>
</tr>
<tr>
<td>4-149</td>
<td>Irreversible and Irretrievable Commitment of Resources. Economic Resources: If pipeline and subsis structures that prevent trawl fishing are not removed at project completion, the long-term loss of commercial fishing opportunities could result.</td>
</tr>
<tr>
<td>4-150</td>
<td>In July-September for a 100,000 barrel spill and determine the effect on (1) Juvenile and marine fish, 2. Larval and adult crab, juvenile and adult marine fish, seabirds, waterfowl, marine mammals, commercial fishing opportunities, contaminated shoreline and nearshore, oil in Nelson Lagoon, Varden Bay, Port Moller, tidelands and wetlands, and bad weather, unstable winds, and low visibility.</td>
</tr>
</tbody>
</table>
Response 4-1a

The data gaps on fisheries that were identified by the Alaska Department of Fish and Game and the United Fishermen of Alaska (UFA) are responded to in detail in the Response 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 CBA 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 CBA Board.

Response 4-2

This concern is addressed in Response 3-3.

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.1.b., the use of Alaska 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 Alaska 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 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.4.1. 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 (ABBOTT, 1969; Thorsteinson, 1964). A 100,000-barrel spill could cover up to 30 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.A.1.e.(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.1.e. of the FEIS).

Response 4-7

No tanker traffic is postulated for the Port Moller area as a result of the Sale 97 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 DI 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/Henreden Bay. The probabilities of contact with this target are given in Appendix C. The likelihood of shoreline contact is given in Appendix C 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 proposals, and for the alternatives under the individual resource categories.
The analysis for fisheries resources is based on the definitions presented in Table 2-1. These definitions focus on regional populations rather than local stocks. Based on these definitions, no-to-moderate effects on regional populations of fisheries resources could be expected; however, serious localized effects could occur on localized stock, which constitutes 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 livelihoods would be present when a spill contacted the nearshore area.

Based on the study of coastal currents and tidal action, oil spilled offshore in any volume has a low probability of entry into Helsen 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.

This concern is addressed in Response 1-11.

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.

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 Bear/Balboa Bay transport facilities. A corridor route was selected for analysis because it was identified as the 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 (SNNP, 1985), and the Bristol Alaska Peninsula National Wildlife Refuge Comprehensive Conservation Plan (USDOI, FWS, 1986). The route identified in Figure 2-5 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 combined probabilities, this appears unlikely. The analysis further assumes that vulnerable livelihoods would be present when a spill contacted the nearshore area.

Examples of transportation difficulties are cited in Section IV.F.5 of the EIS.

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 transported 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 Sake 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 fields 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 27 percent chance that no such tanker spill would occur. The likelihood that such a spill would occur anywhere near the southern side of the Alaska 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 tentative because transportation routing depends on how much and exactly where oil is found—if it is found. A more 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 and
expected 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 those within the model
area, potentially extending as far as the U.S. East Coast. Thus,
the NMS 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 offsets 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 NMS has confidence in its validity. The
referenced but unidentified concerns of the USA are discussed
in specific responses to concerns raised in Letter 6 (from the USA).

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 6 in
Brower et al., 1977). Under such conditions, chemical or natural
dispersion would be more effective than mechanical cleanup equip-
ment (see Fig. IV-7).

Response 4-17

Section IV.B.1.b.(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 Simon, 1970; Todd et al.,
1972], and 10 ppb on herring reproductive success [Hallock,
1981]). Many of the hydrocarbon concentrations cited in the literature,
however, are LC50 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 discussed in IV.B.1.b.(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 Transporta-
tion Systems" (Pan Pacific 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 transporta-
tion 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 Pan Pacific
report assumes, for purposes of the study, that Bering Sea oil
will 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 (Alter-
native 2) 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 tracking miles of seismic surveys needed for sitting 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.3.b.(2) has been rewritten to reflect the recent
distribution of the draft Aleutians East Coastal Management Plan
(CEMP).

Response 4-22

The NMS feels that Stipulation No. 2 (Orientation Program) provides
for an adequate presentation on commercial fisheries. The stip-
ulation requires Sec. IV.B.1.b.(1), 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 ILI provisions (see Response 1-13).
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 NMS has jurisdiction. The NMS does not have the authority to develop measures to mitigate effects on state 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 EIS on Areas of Special Biological Sensitivity (Sec. II.C.1.b. of the FEIS):

1) Port Moller/Mendrosen Bay
2) Nazak Lagoon
3) Izembek Lagoon
4) Becharof Bay
5) Unimak Pass

Response 4-24

The state and local CWSA’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 local CWSA’s the opportunity (once its plan is approved) to review industry plans through the consistency-review process, there is no need to include a "pre-plan" in the stipulation indicating that the NSPO should consult with the Aleutians East CWSA regarding proposed pipelines. The EIS on Coastal Zone Management advises the lessees of the OCS 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 4-28.

Response 4-27

In the absence of documentation for these concerns, the NMS must utilize available information as contained in “Proceedings of a Synthesizes 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 Litt and Leissertse (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 166,000 sq mi after 5 days, with potentially lethal hydrocarbon concentrations (greater than 0.01 ppm) covering a maximum area of 407,000 sq mi during the highly biologically active month of June. There is some variability in measurements of toxicity of petroleum hydrocarbons; toxic effects lasting up to 6 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 5-1 (Summary of Effects) are based on the basic assumptions for effects assessment that 366 MMBls 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 1920s, it is estimated that large-vegetable 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 NMS agreed; 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 NMS 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 developing-stage EIS's and in permitting, and are also useful in monitoring the effects of OCE 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 NMS 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 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 air gun as a sound source, while deep-seismic surveys used an array of airguns. In addition, explosives 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 water should 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 Schedules of Development and Production for Alternative 1) 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 4-43
The concern that the Aleutians East CRSA Board be included in decisions that affect its coastal zone is discussed in Responses 4-39, 4-40, and 4-42.

Response 4-44
The NMS encourages early consultation; however, it is beyond the authority of the Department of Interior to require consultation of the CRSA Board. However, the ITL on Coastal Zone Management does point out why it behooves the Department to contact coastal districts early in the lease/seas decision making 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 4-42).

Response 4-47
This concern is addressed in Response 4-48.

Response 4-48
Although the two referenced ITL's could be combined into one, the NMS'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 tenking) 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 NMS 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 lessors of the Alaska Coastal Management Program and the consistency-review program.

Response 4-50
The NMS 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 4-31).

Response 4-51
We agree that the ultimate effect of an oil spill is dependent on, in part, 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 NMS 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 (WIL's) and lease stipulations are directed toward the mitigation of effects over which the NMS has enforcement authority through the Regional Supervisors, Field Operations. ITL's inform lessees of existing legal requirements; but in most cases, the USDOI (NMS) 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 4-56
As indicated in Section II.C.1.e. (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 4-57
This concern is addressed in Response 4-8.

Response 4-58
Table II-2 does mention important harbor seal pupping and haul-out areas at Port Moller, Igiak Lagoon, and Port Heiden. However, in response to this concern, Nelson Lagoon and Becharof Bay were added to the table.

Response 4-59
The summary section (Table II-2) of this EIS reads as follows, "Loss of harvest through foreclosures of fishing areas by offshore facilities (platforms and pipelines) ...".

Response 4-60
See Response 4-18 concerning the suggestion that a pipeline may not be feasible based on MHS Report No. 110 (Poland, 1968). Offshore loading has been analyzed as a hydrocarbon-transportation option under Alternative 1 (Sec. IV.E.2. of the FEIS).

Response 4-61
The text has been amended to reflect the concerns of the Aleutians East CSS 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 4-62
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 4-63
The Becharof Bay area and surrounding Alaska Peninsula National Wildlife Refuge are designated as PBD (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-4a.

Response 4-64
Information provided by the commenter has been used to update the description of the Aleutians CSSA Coastal Management Plan and the Bristol Bay CSSA Coastal Management Plan (see Sec. IV.F.5.b.).

Response 4-65
This concern is addressed in Response 4-18.

Response 4-66
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 4-67
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 4-68
As indicated in Section IV.A.1.d. (Development and Production-Infrastructure Estimates), the LNG plant at Becharof Bay would be cooled by air rather than water.

Response 4-69
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.1.b. (Probability of Oil Spills Occurring) of the FEIS.

Response 4-70
The mean resource is 364 MMBbls, and projected spillage is 36.4 percent of the number of spills per 1 billion barrels of produced and/or transported oil in Table IV-4. Note that projected platform and pipeline spills would occur within Bristol Bay and are tabulated for the proposal in Table IV-8. Tanker port-calls and at-sea spills would occur south of the Alaska Peninsula and are tabulated separately in Table IV-10.
Table IV-7 presents data for both Cook Inlet and Prudhoe Bay/Kuparuk tanker ports. 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 analyses 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 4.6-70

The resource estimates for Alternative IV have been revised since the publication of the DEIS. The revised estimate shows that Alternative IV has fewer spills than the proposal, therefore, fewer projected spills.

Response 4.6-71

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 statistically 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; Hwang and Monastero, 1982), and has successfully predicted storm conditions 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 Responses 4.6-1k).

Oceanic and Atmospheric Administration uses the Rand model as a tool to identify the best locations to collect physical oceanographic data (see Responses 4.6-1k).

Response 4.7-2

The text has been clarified to reflect this concern (Sec. IV.A.1.C. of the DEIS). For this analysis, three time periods were selected: 3 days to represent quantified 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 4.7-3

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 36-year life of the field. The southern Hori rejection is a spill of such magnitude about every 3 years from fishing-industry or community-subsidy vessels. For example, a community-subsidy barge, the Cornell George No. 10, sank in Koshobok Bay north of the proposed lease area in The summer of 1987, resulting in the release of 1,190 barrels of fuel (Oil Spill Intelligence Report, 1987). In November 1979, the fishing vessel byuomo marooned in the Pribilof, resulting in the release of 7,000 barrels of fuel (Reiter, 1983). 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 trajec-
tories. If the effects on a resource are caused by physical contact with the slick, the NM has longer trajectories.

Response 4-75
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 (Boyce, 1983). In contrast, the smallest spill of 54,000 barrels in the Gulf of Mexico in August 1988 could not be located or identified as a slick 10 days after the spill (Oil Spill Intelligence Report, 1988). No slick was ever identified or located following the tanker Exxon Valdez grounding in Anchorage harbor, which resulted in a spill of 2,700,000 barrels of fuel in January 1989. In Kachemak Bay, north of the proposed lease sale area, the sinking of the Cornelia Marie No. 20 resulted in the release of 2,190 barrels of oil over a 3-month period. The observed slick extended no more than 1 kilometer from the barge (Oil Spill Intelligence Report, 1983), indicating a slick life of no more than a few hours.

Because of these and other case histories, the NM 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 4-77
The NM has no authority to require industry to form a North Aleutian Basin Cost Participation Area (CFA). Spill-response cooperatives have been established by industry for each Alaska OCS oil and gas lease sale, following the oil spill, CFA's cannot be formed before a lease sale because "cost participation" requires knowledge of the year's exploration activity of each participant. Obviously, such knowledge cannot precede the sale. The NM, however, anticipates that industry will form or expand existing CFA's to cover the proposed sale area because CFA's generally provide both a more effective and a more cost-effective spill-response capability. That is, CFA'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 EIS (Sec. IV.A.4. of the FIS) (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 NM before exploratory drilling can occur. The NM agrees with the Aleutians East CBA that this requirement can provide significant protection to sensitive areas. The NM will provide the Aleutians East CBA (once final approval is received) 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-6 reflects tankerings 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 oil spill. The aromatic content of an oil is an indication of its toxic potential. Proposed Shumagin Basin (Sale 66) is on the southern side of the Alaska Peninsula, outside of the model area, and would contribute spillage to the North Aleutian Basin. Sale 86 is currently scheduled to occur in December 1987, 2 years after the sale. 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 oil spills occurring between the southern side of the Alaska Peninsula and market would have increased by about 11 percent.

17

18
<table>
<thead>
<tr>
<th>Crude Oil</th>
<th>API Gravity</th>
<th>Specific Gravity g/ml</th>
<th>Viscosity (100°F)</th>
<th>Pour Point °F</th>
<th>% Asphalt</th>
<th>Ni ppm</th>
<th>V ppm</th>
<th>S %</th>
<th>N %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Murban, Abu Dhabi</td>
<td>40.5</td>
<td>0.819</td>
<td>2.8</td>
<td>-10</td>
<td>7</td>
<td>3.0</td>
<td>9.9</td>
<td>0.96</td>
<td>0.10</td>
</tr>
<tr>
<td>Cook Inlet, Alaska</td>
<td>35.4</td>
<td>0.848</td>
<td>17</td>
<td>-15</td>
<td>12</td>
<td>1.3</td>
<td>0.47</td>
<td>0.09</td>
<td>0.11</td>
</tr>
<tr>
<td>Prudhoe Bay, Alaska</td>
<td>27.0</td>
<td>0.893</td>
<td>19</td>
<td>-10</td>
<td>23</td>
<td>13.5</td>
<td>28.3</td>
<td>0.98</td>
<td>0.27</td>
</tr>
<tr>
<td>Wilmington, California</td>
<td>19.4</td>
<td>0.938</td>
<td>100</td>
<td>5</td>
<td>24</td>
<td>100</td>
<td>80.6</td>
<td>1.8</td>
<td>0.83</td>
</tr>
</tbody>
</table>

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 = Sulphur
N = Nitrogen
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 technologies of development, and the economics of developing the resource. Development and transportation scenarios are constantly being modified to fit the latter parameters, as is the case with Balboa Bay. For EIS purposes, the transportation scenario for the proposal was a transhipment 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 EIS. In the FEIS, oil from Bering Sea sales other than Sale 82 would be shipped by tanker through Unimak Pass directly to vessels rather than being transhipped to a terminal at Balboa Bay. In the cumulative case, oil from Sale 92 would continue to use Balboa Bay as a transhipment-terminal site.

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 southern Bering Sea (which has relatively cold water temperatures and consequently less rapid weathering) is then presented in the EIS.

Section IV.B.1.a.(3) 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.

This concern is addressed in Response 4-17.

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 swimming behavior and changes in patterns of embryological or larval development or behavior in several species of shrimp, crabs, lobsters, sea otters, sand dollars, and fish; feeding in larval and adult lobsters and cancer crabs; food assimilation and growth efficiency in opalescent shrimp; growth and skeletal deposition in corals, scallops, oysters, and mussels; respiration and nitrogen excretion rates in corals and mussels; byssus 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 hyperviscosity, ability to clean surfaces, photosynthesis, survival of copepods, and survival of corals.

We agree that the knowledge of long-term sublethal effects is limited.

The discussion of dispersed 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.).

As stated in Section IV.B.1.a.(3) (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 to produce negligible effects on fisheries resources. The MMS does not expect explosives to be used.

An analysis of the effects of a major oil spill on areas where vulnerable habitats 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.B.1.a. and Response 4-9. Based on conditions in the North Aleutian Basin, a 100,000-barrel oil spill is not expected to cover more than 200 square kilometers.

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 (Kaeser et al., 1980) has been incorporated in the FEIS (Sec. IV.B.1.a.(2)).
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 localized 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 4, 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
In 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 tankerings from Canada or other lease areas north of the North Atlanitic 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 Isebek 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 Coast Participation Area (CFA) 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 spouce would be made to use booms either to divert the oil away from Fort Mclellan or to divert the oil to 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 behind Mclellan Spit. The oil would be contained by booms against the beach - a limited portion of oil. Also, boomed tidal channels behind Mclellan Spit (see Michel et al., 1982) (also see Response A-78).

A discussion of oil persistence on the types of shoreline found in the Fort Mclellan area and elsewhere in Bristol Bay has been added to the text (Sec. IV.A.I.e. of the FEIS).

Response A-105

This concern is addressed in Response 1-3.

Response A-106

The statement quoted by the commentor was taken verbatim from the FEIS; no response is needed.

Response A-107

This concern is addressed in Response A-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 A-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.I.e.(2) of the FEIS). Section IV.B.I.e.(2) provides an analysis of the effects of an offshore-loading-transpotation scenario on marine and coastal birds.

Response A-109

This concern is addressed in the amended paragraphs preceding the cited statement (see Sec. IV.B.I.e.(2) of the FEIS). The probability of oil entering lagoons along the Alaska Peninsula from a pipeline break (i.e., the Fort Mclellan 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 lagoon, 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 impacted 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 a pipeline break occurring at any specific point would be difficult to calculate at this time.

Response A-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.I.e.(2) of the FEIS.

Response A-111

There is some evidence available (Ouster 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.I.e.(2) of the FEIS).

Response A-112

This discussion is not meant in calculating the probabilities that oil spills would contact sea otter concentration areas, the NSF does not assume that an oil spill would be cleaned up. The analysis in Section IV.B.I.e. of the FEIS on site-specific effects of oil spills on sea otters assumes that an oil spill does not contact a sea otter high-use area. An IFL on Oil-Spill-Contingency Plans has been incorporated into the FEIS (Sec. IV.C.1.b.(2)).

Response A-113

The analysis in Section IV.B.I.e. of the FEIS does not suggest that waves would actively avoid "contaminated areas," but rather states that waves can easily move to unaffected areas if the current resource in the contaminated area (which is likely to be a small portion of the available beaches) were reduced as a result of an oil spill. The analysis cites Fay and Lowry (1981) as evidence
that values can easily move from an area of reduced herring food items to other areas of abundant herring.

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 spill area. Also, a spill near Balboa Bay, and contamination of the 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 dispersed and weathered. haulout areas near 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 site of the field is not likely to result in a population reduction or permanent abandonment of a significant amount of habitat area or 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 proportionally 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 affect 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 tidal 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) regulates sea lions, other mammals, and whales and dolphins. The NMFS on FWS Service would not have to respond to a spill or remove oil from the rookeries during the pupping season because the tanker routes would not pass near enough to rookeries to cause any disturbance of pupping activities. The NMFS on FWS can enforce the Marine Mammal Protection Act (MMPA) if OCS air and boat traffic disrupt the seal rookeries by declaring that the air or boat-charter companies are in violation of the MMPA because such disturbance of marine mammals constitutes 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 IBL on Bird and Mammal Protection should not be a stipulation on the lessees because NMFS 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 reintitated before development and production activities occur in the area." Therefore, consultation will occur before development/production EIS is completed.

Response 4-118

The Regional Supervisor, Field Operations (RSMO), will determine if operational constraints are necessary for development during the review process of developmental plans under the appropriate IBL and MLP to implement the reasonable and prudent alternatives set forth in the WMPA's biological opinion. All current seismic activity uses nonexplosive technology. As stated in Section 1.9, "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 analysis then prepares a professional judgment that incorporates the conclusions and hypoth- eses from the data base. The RSMO 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/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 Chervon's recent exploratory drilling in the more restricted confines of Shelikh Strait during the 1988-89 crab fishery without loss or damage to the commercial fishing industry (Kodjak Daily Mirror, March 21, 1989).
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 season for halibut. 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 COCP/ exploration wells that were drilled in the St. George and Navarin Basins, since the former is more heavily fished. We are unaware of any conflicts between these projects and the operation of commercial fisheries in these areas. In high development, the total number of platforms (2) and kilometers of offshore pipeline (390) would be an insignificant increment of insignificant effect on commercial fishing. 

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.3.h., respectively. The oil-spill analysis was used to 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 4-114). Lack of an oil-spill-trajectory simulation, a computer 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 give an indication of contact probability. A discussion on the limitations of tankering in Rabibay is presented in Section IV.F.4. of the EIS.

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 industry should not have any problem securing employees to meet operational needs. The analysis deals in future time, with the effects on subsistence- use patterns with special reference to the non-OCS vessel owners fishing. The description of the community (Sec. III.C.4.) established that there is no deep subsistence tradition existing in Cold Bay. New immigrants, 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 fish resources from other forms of predation, i.e., most notably from sport hunting. Iseakak 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 have been established to protect the threatened Pacific black brant, a major user of Iseakak Lagoon saltmarsh-food resources, especially during the fall southern migration.

Sand Point is not considered to be excluded from the potential economic benefits of the Rabibay LNG terminal. Section IV.B.1.h.(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.

The assumption was made that subsistence fishermen would not be deterred from harvesting tamed 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.

The text has been changed to reflect this concern (see Sec. IV.B.1.b.(4) of the FEIS). 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 deriving 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 Dieleral (Alternative IV) does not include the nearshore area, which was previously removed from the Sale 92 area. The area 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 Kering 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.6.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 Kering Sea sales other than Sale 92 would be tanker through Unalaska Pass directly to markets rather than to a transshipment terminal at Shallow Bay. Sale 92 production would be transported to a terminal at Shallow Bay. The text has been modified in Section IV.A. to indicate that the LNS plant would require about 80 hectares for the proposal. In the cumulative case, the LNS facility also would require about 80 hectares, since only North Alutian Basin 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 visibly limited 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 Alutian Basin (Sale 92) oil. The reference to a 150-acre terminal 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 CSA published its CSIP Public Hearing Draft, and the Bristol Bay CSHA CSIP 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 CSHA’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 CSHA, 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 analysts remain 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 IIL on Coastal Zone Management has been revised to inform lessors of the state’s Bristol Bay Area Plan (1984).

Response 4-137

The actuarial designation for the entire nearshore area of the Aleutians East CSHA 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 CRA 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 ESIS, the Aleutians East CRA policies for facility siting are discussed. The CRA 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 salmon migration path and calving area of the southern subbasin." To eliminate the potential for misinterpretation, the words "of the major salmon 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 grey 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 cases (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 subsurface 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.1.1) (see Graphic 5). A 100,000-barrel pipeline spill between a drilling platform and Prudhoe Bay 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.
Mr. Alan D. Powers
Regional Director
Minerals Management Service
P.O. Box 101559
Anchorage, AK 99519

cc:
N. Alaskan Basin - OCS #2

Comm. on Draft Environmental Impact Statement

Dear Mr. Powers:

We have reviewed the Draft Environmental Impact Statement for the North Alaskan Basin and would like to offer the following comments for your consideration.

BPAS recommends the North Alaskan Basin to be one of the most important exploration prospects among the remaining frontier areas offshore.

We strongly recommend that the OCS #2 lease sale be held as scheduled and that the sale area consist of all blocks as proposed in Alternative A of the DEIS.

BPAS encourages the members of the commercial fishing community and the environmental organizations for the resources of the are. 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 Alaskan Basin. The testimony of the Alaska O&G and Gas Association at the Anchorage public hearing on February 20th 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,

J.R. Grandon

SD/INO/new
III. Comments on DEIS Section 10.5-11. 

In the context of the DEIS Section 10.5-11 which describes birds and marine mammals, habitat supporting these species, and possible impacts on species or their habitat which could result from this lease sale, we found numerous inconsistencies in socioeconomic assessments and deficiencies in the information on which these assessments were based. The following comments highlight some of our concerns:

1. The DEIS Section 10.5-11 in its presentation of the overall potential impacts on marine and coastal birds, Table 5-7, 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 Bering Sea or the Aleutian Islands a heavily used waterfowl nesting area (Kudak or Helen Lagoon) 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 oil spill, that the period of high risk constitutes a large portion of the probable drilling season, and that the actual spills would result in 20-10 years (1976-1986), it is unreasonable to assume that these do not contribute to a MODERATE level of impact. The potential effectiveness of mitigation measures is not stated, nor is it reflected in the detailed and comprehensive data presented in the DEIS. The DEIS Section 10.5-11 C-10-12 also lists potential impacts for the aforementioned areas, and it is not clear how these impacts can be considered MODERATE.

2. Even when stipulations are in place, they cannot be expected to reduce impacts. Data show that in the absence of mitigation, impacts will occur.

3. The DEIS Section 10.5-11 C-10-12 also lists potential impacts for the aforementioned areas, and it is not clear how these impacts can be considered MODERATE.

4. The DEIS Section 10.5-11 C-10-12 also lists potential impacts for the aforementioned areas, and it is not clear how these impacts can be considered MODERATE.

5. Certain studies indicate that the potential for significant impacts on birds and marine mammals is substantial. The DEIS Section 10.5-11 C-10-12 also lists potential impacts for the aforementioned areas, and it is not clear how these impacts can be considered MODERATE.

6. Certain studies indicate that the potential for significant impacts on birds and marine mammals is substantial. The DEIS Section 10.5-11 C-10-12 also lists potential impacts for the aforementioned areas, and it is not clear how these impacts can be considered MODERATE.

7. Certain studies indicate that the potential for significant impacts on birds and marine mammals is substantial. The DEIS Section 10.5-11 C-10-12 also lists potential impacts for the aforementioned areas, and it is not clear how these impacts can be considered MODERATE.

8. Certain studies indicate that the potential for significant impacts on birds and marine mammals is substantial. The DEIS Section 10.5-11 C-10-12 also lists potential impacts for the aforementioned areas, and it is not clear how these impacts can be considered MODERATE.

9. Certain studies indicate that the potential for significant impacts on birds and marine mammals is substantial. The DEIS Section 10.5-11 C-10-12 also lists potential impacts for the aforementioned areas, and it is not clear how these impacts can be considered MODERATE.

10. Certain studies indicate that the potential for significant impacts on birds and marine mammals is substantial. The DEIS Section 10.5-11 C-10-12 also lists potential impacts for the aforementioned areas, and it is not clear how these impacts can be considered MODERATE.

11. Certain studies indicate that the potential for significant impacts on birds and marine mammals is substantial. The DEIS Section 10.5-11 C-10-12 also lists potential impacts for the aforementioned areas, and it is not clear how these impacts can be considered MODERATE.

12. Certain studies indicate that the potential for significant impacts on birds and marine mammals is substantial. The DEIS Section 10.5-11 C-10-12 also lists potential impacts for the aforementioned areas, and it is not clear how these impacts can be considered MODERATE.

13. Certain studies indicate that the potential for significant impacts on birds and marine mammals is substantial. The DEIS Section 10.5-11 C-10-12 also lists potential impacts for the aforementioned areas, and it is not clear how these impacts can be considered MODERATE.
VI-10

VI-11

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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 declines for seal population (it is being considered for addition to the threatened species list under ESA).

The DCS also oversees additional information which might be relevant for other species. For example, biologist J. All. Sheer and colleagues observed that the survival rate of polar bears was lower than expected. Three polar bears were observed for 15 to 30 minutes in a polar bear transect. The bears showed no signs of comfort or interest in the area.

In addition to this work, the study led to several important findings. First, the polar bears not only showed no evidence of stress but, on the contrary, seemed more comfortable in the environment. Their fur and even from the skin conditions were better than those observed in previous years. Second, all oil pollution caused severe stress and stress-related mortality, thereby reducing the overall health of the bears. This stress led to a significant increase in body weight and stress levels under all conditions. Third, injection of oil to the bears was observed toxic in a wide range of internal organs, including the brain, liver, bone marrow, intestine, lungs, and kidneys. The toxic effect of the oil was lethal and did not become apparent until three to five weeks, after initial contact. The study concluded that polar bears should be heavily protected from contact with oil spills and, if contact with oil occurred, immediate immobilization, cleaning, and treatment of the animals 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 attempts to clean their fur. This ingestion could result in necrosis similar in nature to that observed in polar bears.

Fay (pers. comm.) notes:

"The effects of noise and other disturbances seem to be recorded in the DCS as trivial in most instances, but they are real. The noise and disturbance can produce what is known as "stress" or "behavioural changes." These can include changes in feeding habits, altered migration patterns, and changes in reproductive success."

Of course, these humpback and their young have not been observed closely. Consequently, we cannot be certain about marine mammals and their direct death and injury to have a look at them at close (disturbing) range. Furthermore, these humpback and their young will not be the first or only source of disturbance: the marine mammals of the region are already heavily impacted by disturbing aircraft and boats, at least during summer, autumn, and fall. This fact was not taken into account here. The new sources of disturbance from DCS activities will be 50 addition to the present ones.

F. 19-85a. Given the large numbers of pinnipeds and other on the north side of the Peninsula, we find it hard to believe that DCS does not analyze the impact of the tanking facility and associated activities on these animals.

F. 19-86a. There still remains considerable uncertainty regarding the effects of seismic testing on endangered whales. At the 1985 boomhead conference this was pointed out especially by Herman and others. Our work, however, failed to reveal any significant effect of the oil spill. Imboden et al. (1985) reported extensive killing of marine mammals at distances ranging from 3.5 km to 6.7 km. Clarke et al. (1985) reported that gray whales did not respond to industrial noise. With increasing use of offshore areas, "new" sounds are beginning to be a great deal more distant. In order, there is also a direct relation to noise from ships and boats, which includes slower speeds, maneuvering, 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 area (i.e., feeding, use of lungs, etc.), we do not believe that the conclusion on Hiais-46 regarding noise is fully accurate or supported by the data.

F. 19-86a. The impact of an oil spill on grey whales (also known as humpbacks, right whales, or other baleen whales) is certainly an unknown. When reporting the results of field studies in the area, the DCS does present most of the available data on this topic, the uncertainties surrounding these topics have not been discussed. A few examples follow:

Haisen fouling. Experimental evidence indicates that oil can foul haisen, 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 haisen 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 not been taken by the whales. Gray whales feed on benthic organisms and apparently "flee" the bottom to get them. Oil in sediments could be a serious problem for whales if they were feeding in the area. There is some information indicating that they could detect such oil and avoid it. There are indications that the nearshore areas for the North Alaskan Basin could be important for gray whale feeding. The effects of an oil spill could be very important in this region if the oil got into these nearshore areas.

"There is very little information on the effects of oil on cetacean skin. The works of Isacoff and St. Aubin on dolphins indicate that this was not a problem. However, no way we can determine, they did not make an attempt to track the fate of the oil. If the oil did disperse out of the skin into the water after the cup was recovered, or did the oil for a fraction of the spill move into the skin or the bloodstream? This question is central to the understanding of the possible impact on cetacean skin. This question is further complicated by the fact that gray whales or balaenids, which have roughened or toughened skin, may retain oil internally."

"There is also little or no information on the effects of inhalation of vapors by cetaceans. Isacoff and St. Aubin simply estimated the amount of vapor which might be inhaled for a hypothetical spill. So many factors enter into this question that their information must be viewed as hypothetical at best. An 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 leaking on marine mammals in the North Alaskan Basin.

11. CONTENTS 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 the habitat and oceanic features controlling the North Alaskan Shelf. There are some inaccuracies and uncertainties which have been noted in the "Scientific Comments" section.

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 Alaskan Basin. For example:

The synthesis report (Thoratskina, 1965) states that "the distribution, abundance and population dynamics of red king crab in nearshore waters off the North Alaska are not as well described. Despite many crab surveys in the eastern Bering Sea, little work has been done shoreline and 50 miles inshore has been accomplished. This lack of information on the distribution and habitat preferences of the red king crab in nearshore areas is not complete." And later that, "Identification of juvenile king crab habitat along the north 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 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 Alaskan Basin can be found under separate cover.

The following are specific comments on the Fisheries Resources section of the DEIS.

SPECIFIC COMMENTS

Salmonids

II-B-1.1, last sentence on the page continuing on to II-B-2. "Migration rates for the five species from the shelf area to the Yukon River in Bristol Bay were estimated by Drury (1961). in fisheries from 2 to 60 percent per day. Actually, only migration rates for coho and pink are known -- rates for the other species are hypothetical. As it is stated in the synthesis report (Thoratskina, 1964), "Drury (1961) and communication at the meeting) estimates rates of travel for juvenile sockeye and coho salmon, at 5 to 10 and 15 to 20 km/day, respectively."

"Presumably pink, chum, and chinook salmon would travel at slightly lesser or greater rates depending on the type of juvenile area the rate of passage through the fishing grounds in the stuff isn't known.

6-18
same conditions, however, these dates do not to ascertain this.

IT-B-2. first paragraph, sentence beginning, "Juvenile salmon inhabit
nearshore waters of the North Alaskan Shelf are poorly described.

6-19

Despite many crab surveys in the southeastern Bering Sea, little work
has been done toward the 50- to 60-km shelf. However, the DEIS
reserves assessment for king crab does not mention this need for
under the generally heading of "Salmonids" was presented in the
synthesis report (Thorsethsteinson, 1984) states, "Of the five species
inhibiting the Bering Sea, only sockeye salmon have been
studied sufficiently to describe, in detail, the juvenile walleye
migration. Information on the spawning, migration of the other species
from Bristol Bay and salmon from streams draining the north side of the
southeast peninsula is fragmentary, and obtained incidentally from
studies during the 1981-1982 or from casual observation by area
fishery managers."

6-20

IT-B-2. Figure III-14 (although correctly titled) is referenced as
prematurely juvenile salmon, as described in this figure. However, this
figure does not depict any control patterns for juvenile sockeye. Furthermore,
early in the season, the entire sockeye sockeye--sockeye fishery--sockeye
studies, not published--1981-1982 did not report on this study.

6-21

IT-B-3. second paragraph. 5th 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
have been identified. Collectively, they constitute the regional population.
It is possible that the population earlier in the season to:

6-22

IT-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 in end. Reference is
made to the hypothetical nature of the population presented in this
figure. This should be made clear when Figure III-6 is first referenced.

6-23

References

Tackle Decision

IT-B-4. 5th paragraph. This states that elvers and alewife are
preferred salmon substrates but that "..." may be deposited on
whatever substrates is available. Is there a reference to back on this
claim?

Cassel

IT-B-6a. 7. Cassel is described solely as a forage fish. There should,
however, be some discussion of the commercial value of cassel. There
is a potential for commercial fisheries for cassel in the future.

IT-B-6a.8. The synthesis report (Thorsethsteinson, 1984) states that "the
distribution, abundance and population dynamics of red king crab in
offshore waters of the North Alaskan Shelf are poorly described.

6-24

6-25

IV-B-1a. Effects on Fisheries Resources

GENERAL CONCEPTS

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 affected from the worst case spill of 100,000

2. Effects on local overlap of fish have negligible or minor

3. Following a spill, oil remains toxic to marine organisms for only

4. Adult marine organisms experience lethal affects from exposure to

5. The DEIS consistently claims that in the worst case scenario of a

6. This argument is repeatedly used to assert that adverse biological

7. This assumption and the DEIS in its further,

8. These are included in the following:

- The Bravo spill of approximately 70,000 barrels covered


3. Toxicity of Oil Following a Oil Skiff

The second assertion is that "highly toxic aromatic compounds readily evaporate into the air, so an oil slick on the water surface remains toxic to organisms for approximately a week, depending primarily on temperature." (SUV-2). Actually, much longer effects of toxicity have been documented (Houwars, 1985a). Examples include:

- The IVTC/IFC blowout was apparently still toxic even after it had traveled 1,000 km across the Gulf of Mexico (Armstrong and Linde, 1983).
- Following the Area Merchant skiff, concentrations of dissolved oil in Georges Bank remained above background levels for at least 3 months following the spill (Loomis et al. 1976; Ferrington and Brown, 1985; Houwars, 1985a).

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 (Houwars, 1983a).

A stronger statement, "Aromatic compounds in crude oil spilled in the southeastern Bering Sea were estimated to weather in 8 to 12 days (Hansen, 1982)," is later made on pages IV-D2-IV-D2 of the DEIS. Chromatic Hydrocarbons are often considered the most toxic constituents of oil (National Academy of Sciences, 1975; Houwars, 1985c). However, Houwars (1985c) states that "recent evidence strongly indicates that many of the aromatic compounds that remain toxic for much, much longer than the DEIS assumes and much longer even the conclusions of Hansen. As cited in the DEIS, would indicate."

4. Conclusions of Oil Evacuation and Toxicity 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 (12.8-22), which provide values for concentrations that 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 die when exposed to laboratory treatments for a period of 96 hours. By definition, more organisms would die at a lower test concentration, and half of the test organisms would die at a concentration higher than that used. The table does not provide a basis on which to assess the DEIS accurately. The lethal toxicity will not occur at concentrations below the LC-50 value (Houle, 1985).

In addition, the literature values of LC-90's are not precisely known quantities (Houle, 1985a). Halin and Hopes (1981) warn about the "virtual inability to closely compare or directly 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 Hoese and Duer in 1974 (Houle, 1985a).

a. Lethal Effects

Table IV-14 indicates that the lethal concentration range of oil for fish eggs and larvae is the highest, with concentrations up to 10 ppm. A tremendous amount of research on this topic indicates that much lower concentrations are toxic. For example, Underwood and Cazeal (in press) concluded that estuarine concentrations as low as 0.002 to 0.01 ppm can 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 (Houle, 1985a). By not including this safety factor, the DEIS has dramatically underestimated the possible lethality even to adult fish and shellfish (Houle, 1985a).

b. Sublethal Effects

Sublethal effects were underestimated in Table IV-14. Sublethal effects have been observed in a variety of marine organisms at concentrations of oil as low as 0.002 ppm to 0.010 ppm (Stein 1979; Houle 1979; Houle 1985).

Very low concentrations of oil could potentially affect fishery recruitment even at concentrations too low to cause outright mortality. Initial oil and larvae (Houle 1985a). Sublethal effects include (1) delayed hatching of eggs and slowing of the growth of juveniles (Shushake 1977; Houle, 1985); (2) exposure of eggs and larvae to more predation caused by slower growth rate (Hibbs 1980); (3) bottom further emphasizes that larval growth rate is the most important factor controlling recruitment, and (3) decreased survival of "hatching, embryos and larvae caused by oil exposure to adult females just prior to spawning (Shushake, 1977; Houle, 1985).

The DEIS (IV-B-4) acknowledges that sublethal effects occur; "Fish exposure and larvae may have abnormal growth and development following exposure to Prudhoe Bay crude oil at concentrations as low as 27 ppm. Exposure to levels as low as 25 mph resulted in lower numbers of hatching, eggs hatching, and 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 substantially) inaccuracies in the assessment of effects on fisheries include the following:

1. PME refers to two types of probabilities for oil impacting a specific area — conditional and final. Conditional probabilities assume that an oil spill has occurred. These probabilities are appropriate for use in impact assessments as it is predicted (and must be assumed) that an oil spill of 1,000 to 100,000 barrels will occur.

2. PME, however, constantly refers throughout the impact assessment to the "probability of an oil spill occurring and subsequently contacting a specific area." These are "final probabilities" and should not be used as such since those areas are "too close to adding in probabilities associated with oil spill occurrence."

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 DEIS uses this "final probability" in 20%, and is offered frequently throughout the DEIS to counter potential impacts.

3. 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 field data exist for this area, therefore, it is hard to believe that PME is evaluating potential impacts on the southern side of the Peninsula.

SPECIFIC CONCLUSIONS

The following are additional, specific comments on sections IV-B.1., (1) General Discussion and IV-B.1.9., (2) Site-Specific Effects of Oil Spills.

**General Discussion**

- PME 24, paragraph 2, "It is expected that the seismic work would have a negligible effect on the fisheries resources of the North Alaskan Basin lease area." The following should be added: "Provided explosive sources are not used."

...
6-39.  The impact assessment of all oil spills on pelagic habitat assumes that only an area of 200 km² will be affected. The areas impacted would most likely be far greater than this, and could affect a significant portion of the entire lease area (Howarth, 1985a).

6-40.  The DEIS indicates that oil spills will reach sediments following oil spills, and that oil concentrations on the sediments have remained low for many years, creating a relatively low risk on benthic communities and juvenile salmonids. However, Howarth (1984c, 1985a) asserts that oil persistence in sediments may be far greater than previously thought. Although this release is mentioned in the DEIS as a possible long-term problem, this issue was not discussed in any of the site-specific fishery analyses.

6-41.  The USGS report (Howarth, 1985a) found evidence of oil spills 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 appeared not to be toxic to benthic communities. In the case of at least one platform, toxicity of oil contaminants to benthic communities is not known (Howarth, 1985a).

6-42.  The USGS report (Howarth, 1985a) found evidence of oil spills 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 appeared not to be toxic to benthic communities. In the case of at least one platform, toxicity of oil contaminants to benthic communities is not known (Howarth, 1985a).

6-43.  The USGS report (Howarth, 1985a) found evidence of oil spills 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 appeared not to be toxic to benthic communities. In the case of at least one platform, toxicity of oil contaminants to benthic communities is not known (Howarth, 1985a).

6-44.  The USGS report (Howarth, 1985a) found evidence of oil spills 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 appeared not to be toxic to benthic communities. In the case of at least one platform, toxicity of oil contaminants to benthic communities is not known (Howarth, 1985a).

6-45.  The USGS report (Howarth, 1985a) found evidence of oil spills 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 appeared not to be toxic to benthic communities. In the case of at least one platform, toxicity of oil contaminants to benthic communities is not known (Howarth, 1985a).

6-46.  The USGS report (Howarth, 1985a) found evidence of oil spills 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 appeared not to be toxic to benthic communities. In the case of at least one platform, toxicity of oil contaminants to benthic communities is not known (Howarth, 1985a).

6-47.  The USGS report (Howarth, 1985a) found evidence of oil spills 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 appeared not to be toxic to benthic communities. In the case of at least one platform, toxicity of oil contaminants to benthic communities is not known (Howarth, 1985a).

6-48.  The USGS report (Howarth, 1985a) found evidence of oil spills 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 appeared not to be toxic to benthic communities. In the case of at least one platform, toxicity of oil contaminants to benthic communities is not known (Howarth, 1985a).

6-49.  The USGS report (Howarth, 1985a) found evidence of oil spills 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 appeared not to be toxic to benthic communities. In the case of at least one platform, toxicity of oil contaminants to benthic communities is not known (Howarth, 1985a).

6-50.  The USGS report (Howarth, 1985a) found evidence of oil spills 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 appeared not to be toxic to benthic communities. In the case of at least one platform, toxicity of oil contaminants to benthic communities is not known (Howarth, 1985a).
most likely as far as this is concerned, and could affect the overflow of the entire sea area (Moffat, 1956).

2. It is also assumed that the portion of a regional population which is affected by the size and seasonal distribution of spawning distributions. The size and temporal separation of adult salmon is critical to limiting an oil spill. Local stocks often represent a significant portion of the total stock. For example, the Nakina and Kuskokwim River sockeye stocks (very aggregated spatially and temporally) often produce over 50% of the sockeye salmon har- veste–

2. 5.1.5

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4. 2. 1. 3.

4. 2. 1. 6.

4. 2. 1. 7.

4. 2. 1. 8.

4. 2. 1. 9.

4. 2. 1. 10.

4. 2. 1. 11.

4. 2. 1. 12.

4. 2. 1. 13.
2. The impact assessment of an oil spill assumes that only an area of 200 km² will be affected. The area impacted would be determined using a computer program of simulating juvenile salmon survival. The probability of oiling all the Port Moller area in an oil spill is very low. It is a significant portion of the entire area (Wourth, 1995a).

3. The conclusions of Wourth, as cited in the DEIS, would indicate that, if oil spill would be toxic, it would be toxic for 3 days, since it reached Port Moller. Additionally, a spill 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 (1995a). Thus, it is ludicrous to suggest little likelihood of an oil spill contacting nearshore areas unless vulnerable were present, with hydrocarbon concentrations high enough in cause lethal effects. This probability is quite large, and the potential effects on salmon in the Port Moller area could be major.

4. The species most likely to be affected were pink and chum when all five species utilize these areas. Once again, final probabilities are presented.

5. The species most likely to be affected are pink and chum; when all five species utilize these areas. Once again, final probabilities are presented.

6. The species most likely to be affected are pink and chum; when all five species utilize these areas. Once again, final probabilities are presented.
what other options are available? If migration is not delayed, won't there be a future-fatal migration through the study area?

6-74, paragraph 3. Inaccurate assumptions once again include that a migration of 200,000 will be affected, effects on local populations do not affect rational populations, adults experience lethal effects only at 100% of the total population. Thus, the broad claim that any mortality which resulted would affect only a portion of the herring population and not the entire population is unsubstantiated. Subsequent impacts on anadromous salmon would be unquantifiable. The cumulative effect should be at least as that of the proposal effect. Thus, cumulative effects should be estimated as MAJOR.

6-76, conclusion. The cumulative effect should be at least as that of the proposal effect. Thus, cumulative effects should be estimated as MAJOR.

6-76, conclusion. Excludes effects (includes herring affect). Excludes effects.

6-78, paragraph 2. 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 affect nearshore areas while sustainable life stages were available. All of these contingencies have a high probability of occurring (i.e., areas to lethal concentrations of hydrocarbons, with vulnerable life stages within nearshore areas). Thus, in order for adverse effects to result, the probability of occurrence of oil contacting nearshore areas within 3 days -- see above for full discussion -- is likely.

6-78, paragraph 2. 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 affect nearshore areas while sustainable life stages were available. All of these contingencies have a high probability of occurring (i.e., areas to lethal concentrations of hydrocarbons, with vulnerable life stages within nearshore areas). Thus, in order for adverse effects to result, the probability of occurrence of oil contacting nearshore areas within 3 days -- see above for full discussion -- is likely. Vulnerable life stages are present from early spring through summer. Thus, the effect is likely to be MAJOR.

6-79, paragraph 2. Port Heiden. The DEIS states that there is a 20% chance of oil contacting Port Heiden within 30 days. Hence, the probability of occurrence of oil contacting nearshore areas being by spilling herring in the vicinity of Port Heiden is remote. A thirty percent chance of contact is not a "remote" event. 6-80, paragraph 2. The DEIS presents that the 99.5 percent chance of oil contacting the Port Moller area within 3 days as "relatively high." This is an obvious understatement.

6-80, paragraph 2. The DEIS mentions that effects of an oil spill contacting Port Moller would be mitigated because there are other shipping routes in Togiak and Port Heiden. However, there is also a high probability that Port Moller would be affected (a 30% chance of contact within thirty days or a spill). If the Port Moller/Pt. Moller has been affected with oil, this would be a significant portion of the rational population. The claim by the DEIS is that the occurrences of lethal effects are not affected. The occurrence of lethal effects in herring hatching in port, being lethal, has been substantiated. It has been hypothesized (MFSAS) that recruitment may not occur since the stocks are genetically separable. Additionally, the claim that effects on herring spawning would be mitigated within a few years does not take into account the effects on herring spawning and recruitment. If recruitment did occur, would the appropriate substrate for spawning be available?

6-82, conclusion. The cumulative effect should be at least as that of the proposal effect. Thus, cumulative effects should be estimated as MAJOR.

6-82, conclusion. The cumulative effect should be at least as that of the proposal effect. Thus, cumulative effects should be estimated as MAJOR.

6-83, paragraph 2. That impacts will not occur because the stocks are genetically separable; additionally, the claim that effects on herring spawning would be mitigated within a few years does not take into account the effects on herring spawning and recruitment. If recruitment did occur, would the appropriate substrate for spawning be available?

6-83, conclusion. The cumulative effect should be at least as that of the proposal effect. Thus, cumulative effects should be estimated as MAJOR.

6-85, paragraph 2. That impacts will not occur because the stocks are genetically separable; additionally, the claim that effects on herring spawning would be mitigated within a few years does not take into account the effects on herring spawning and recruitment. If recruitment did occur, would the appropriate substrate for spawning be available?

6-85, conclusion. The cumulative effect should be at least as that of the proposal effect. Thus, cumulative effects should be estimated as MAJOR.

6-87, paragraph 3. The DEIS again presents final probabilities as a function factor. This is misleading since it is possible that within a few years an oil spill will occur. It is also stated that "for moderate adverse
effects on groundfish species of the North Atlantic Basin to occur, lethal concentrations of hydrocarbons from oil spills would contact areas when eggs and larvae were present. However, eggs and larvae have lower acute toxicity than adults (Table IV-8-2). Ingestion of low concentrations to eggs and larvae 10-100 ppm and less — Table IV-14, Norway Mgrim - 10-100 ppm and less. The DEIS states that gives the limited area influence of a spill... "The assumption that this area would be affected is unconsolidated and indefensible. The area impacted most likely be far greater than this, and could affect a significant portion of the oil spill release area (Northrup, 1988b)."

1-115V-8-27, paragraph 2. DEIS again assumes 200 km² is maximum area affected.

1-115V-8-28, paragraph 1. "An offshore oil spill which did not contact nearshore areas..."

1-115V-8-29, paragraph 1. "An offshore oil spill which did not contact nearshore areas will result in limited mortality and substantial effects on planktonic groundfish eggs and larvae."

1-115V-8-29, paragraph 2. "The DEIS (IV-8-28) previously stated that..."

1-115V-8-29, paragraph 3. "The DEIS also states that..."

1-115V-8-30, paragraph 4. "The DEIS once again assumes an affected area of 200 km² and, thus, only localized effects would occur."

1-115V-8-30, paragraph 5. "The DEIS states that..."
6-102 IV-B-32. Paragraph 2. The DES claims that the extent of the effect of an oil spill on the life stages of crabs would depend on the lifetime of the spill (6-109). The DEEIS states that the spill duration is likely to be from 1-10 days for a large percentage of the time. The life stages of crabs are vulnerable to the effects of oil spills, which can be lethal. The DEEIS assumes that the spill is in a confined area (e.g., Texas) and that the area covered by the spill is less than 1 million square kilometers. The DEEIS also assumes that the spill is in an area occupied by a large number of individuals with a high number of vulnerable life stages. The conclusion should be that a large spill is likely to occur for a regional crab population. 6-103

6-103 IV-B-33. Paragraph 3. There has been no oil spill modeling or trajectory analysis for the south side of the Peninsula. Thus the number of life stages and the effects of the regional population could be underestimated. The DEEIS also mentions the importance of the regional population and the potential for mortality that could result from a moderate spill is unconfirmed and underestimated.

6-104

6-104 IV-B-36. Paragraph 1. Impacts are assessed assumed extent of a spill (i.e., 200 km²). The DES also mentions "limited juveniles and adult mortality" at concentrations would be high enough to cause mortality for both of these life stages.

6-105 IV-B-36. Paragraph 2. The DEEIS states that the spill duration is likely to be from 1-10 days for a large percentage of the time. The life stages of crabs are vulnerable to the effects of oil spills, which can be lethal. The DEEIS assumes that the spill is in a confined area (e.g., Texas) and that the area covered by the spill is less than 1 million square kilometers. The DEEIS also assumes that the spill is in an area occupied by a large number of individuals with a high number of vulnerable life stages. The conclusion should be that a large spill is likely to occur for a regional crab population.

6-105

6-105 IV-B-37. Paragraph 2. A major offshore oil spill which did not contact important nearshore areas would result in limited morbidities and sublethal effects on benthic crab larvae, adult crabs, and planktonic food web organisms. The areas with "limited" are applicable to the benthic adult crabs. The rest should read "would result in mortality and sublethal effects on the benthic adult crabs." 6-106

6-106 IV-B-37. Paragraph 3. Only a major oil spill, which contacted and destroyed nearshore areas at lethal concentrations of hydrocarbons when measured in parts per million, would produce a greater than minor effect on the regional population of one or more species. A major oil spill will contact the nearshore areas (1995 probability of contacting Port Nodler within 3 days, will definitely in concentrations high enough to cause lethal effects on previous discussion). Thus, there could be a MAJOR effect.

6-107

6-107 IV-B-37. Paragraph 2. "Red king crab, with its current depressed populations and its limited "un-contacted" areas, would be affected severely (i.e., a MAJOR effect) for a large area of "un-contacted" nearshore areas. The DEEIS assumes that the spill is in a confined area (e.g., Texas) and that the area covered by the spill is less than 1 million square kilometers. The DEEIS also assumes that the spill is in an area occupied by a large number of individuals with a high number of vulnerable life stages. The conclusion should be that a large spill is likely to occur for a regional crab population. A large spill would result in limited morbidities and sublethal effects on benthic crab larvae, adult crabs, and planktonic food web organisms. The areas with "limited" are applicable to the benthic adult crabs. The rest should read "would result in mortality and sublethal effects on the benthic adult crabs."

6-108

6-108 IV-B-37. Paragraph 3. Only a major oil spill, which contacted and destroyed nearshore areas at lethal concentrations of hydrocarbons when measured in parts per million, would produce a greater than minor effect on the regional population of one or more species. A major oil spill will contact the nearshore areas (1995 probability of contacting Port Nodler within 3 days, will definitely in concentrations high enough to cause lethal effects on previous discussion). Thus, there could be a MAJOR effect.

6-109

6-109 IV-B-39. Paragraph 1. Effects are potentially MAJOR for all species except red king crab for which there is a high probability of a CATASTROPHIC effect.

6-109
Houarths. Georges Bank has many similarities in the southeastern Bering Sea — it is a highly productive area biologically, dominated by large numbers of demersal fish and shrimp. Fish and invertebrate temperatures are cold; weather can be severe; and circulation regime renders the region a relatively isolated ecosystem. Some of the information provided by Houarths includes:

- Oil slick dissipation may be due to dissolution rather than evaporation, especially in high-energy situations such as storms where wave motion induces emulsifications.
- 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 in the bottom is a significant mixing factor which could occur because of advection to sediments or by transfer via fecal pellets of spatformers. 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 Area Merchant spill on walrus and seal eggs. More than 90% of the eggs sampled near the ship were dead.
- Information on the effects of Louisiana congeneric fisheries is provided, showing significantly lower catch per unit effort for some species.

Also attached is a reprint by Teal and Houarths (1984) on the ecological effects of spills and a journal article by Houarths (1986) on the oil/fisheries issues.

I. Comments on DEIS Section IV(a)(3)
II. Oil Spill Risk Analysis

General Comments

We believe that the oil spill 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, 16 with ice cover) to give a reasonable spill trajectory simulation from each of those sites. The model also covers such a large area, with relatively few terrains (especially ice 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 oil spill trajectories on the south side of the Alaska Peninsula. We recommend that the FCIS include an oil spill trajectory analysis of the Halibut Bay facility and tanner routes into and out of that area.

Comments on the specific sections of the Risk Analysis are presented below.

A. The DEIS Has Unreasonable Assumptions in Assessing the Potential for Oil Spills within the Area

The method used in the DEIS to assess the possibilities of an oil spill in the north Aleutian Basin is similar to the approach used in other GIS prepared by MMS. As has been pointed out in previous comments, this approach suffers from limitations which we believe cause the document to seriously understate the risk from the proposed activity. This in turn causes the DEIS to underestimate the threat posed by offshore petroleum exploration and development to a range of biological resources in the area.

The most obvious problem in the oil spill risk analysis section of the DEIS is that there is an implicit assumption that the risk of oil spills 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 climates, number of daylight hours, weather and visibility, oceanography, geology, seafloor, the presence of ice, remanence of the lease area from support and supply bases, and the host of other factors strongly argue that the potential for accidents in the northern frontier areas is much higher than for areas such as the Gulf of Mexico where
A second issue in the comparison used in the DEIS of Alaska accidents rates is national OCS accident rates. The first, and most obvious criticism, is that NOAA uses Alaska OCS statistics and compares them to nationwide OCS statistics. We believe if the information were more complete and certain analysis results which should be viewed with some reservations.

Cook Inlet field production has been declining over the past several years. Characteristics of the fields are declining.

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 than offshore OCS.

We found the list of spills for the developmental years - a list which has historically accurate and reliable statistics. Compared to the 1991 estimates of spills for the developmental years, which historically have higher spill rates - are incomplete, so a fair evaluation is difficult.

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 diligent reporting requirements as the U.S. These numbers may not be accurate.

As a final consideration, we would point out that the future Group reports that North Sea tanker spill rates are around three times lower. 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.

We suggest that NOAA has been propagating the rationale it has chosen to use in its spill rate data. This includes the proposition that the spill rate data are consistent and that the spill rates are not significantly different.

We also observed that the spill rate data are consistent and that the spill rates are not significantly different.

A related problem is that there is apparently a distinct lack of realizability of offshore weather data available. As we understand it, neither NOAA nor RAND have been able to gain access to the Exxon, BP, or Shell data for use in this EIS. Offshore data comes from the NOAA electronic or systematic charts which are extrapolations from onshore weather stations. This is clearly a significant topic in estimating surface winds which is used in the meteorological wind models.

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 very difficult to determine the model's effectiveness in predicting nearshore winds and resulting spill movement. Close to Peninsula coastal winds become increasingly affected by orographic effects. This effect has been pointed out in other coastal areas. Recently, Schmacher and Huss (1981) - i.e., spill rates are directly affected by wind velocity. We observed that the wind in mountain systems (Pit, Valley and Cold Bay) persist large scale winds. Therefore, circulation in the
neareast area could be quite variable. It is unclear whether or not the model can account for local variations in the distribution on such phenomenon as well as large scale influences. The model has also been assessed for applicability in the pelagic environment, especially since the data set should seriously affect the utility of the model in the nearshore environment.

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 predicted by a large database. We have been unable to determine how long that database actually is, or for discussion purposes our will for 10 years. Our understanding is that the data are divided into three sets: summer, winter, fall. For these three sets, the 10 year "averages" are calculated. The model then uses these three sets as inputs to the model, and the results are summed up yielding probabilities for spill trajectories. Thus, what we believe to be the average probability that a spill will follow a particular trajectory. Note that this is not the same as the probability that a spill trajectory very close to the x-axis would expect from the input data.

The serious problem here is that Bermuda 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 trajectory would correspond with the input data, because that is what computer models are supposed to do. What it does not do is generate results which are accurate and which give us the risks to biological resources. Instead, we suspect that HMS should announce: "the probabilities are simply hypothetical spill trajectories which may be accurate under a limited set of circumstances."

3. Another problem with the model is that it presumably some surface alone. There are many problems with this, i.e., all the species of pelagic species which rely on these numbers.

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 only affect at-sea species, especially marine mammals and certain pelagic species such as swordfish and fur seals.

For example, as can be determined from the graphics in the DEIS, there is only one sea target for the nearshore waters between Union Pass and Fort Myers. If a spill were to occur in this region, it could have serious impacts on a range of biological resources, including (depending on the size of spill) gray whales, whales, large numbers of birds, and major fishing resources such as salmon, crab, and bottomfish (particularly if oil became entwined in bottom sediments) as well as important commercial fishing activities. Yet, unless the spill goes ashore or hits that one pelat, it will register no impact to the trajectory analysis. Because of this, we believe that the spill model should have identified at-sea targets in the nearshore waters along the Alaskan 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 oil spill 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 DEIS.

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 RAB "year" divided into three months only report information on a yearly basis. Thus, for any season, the monthly probabilities are considered equal (i.e., no significant change 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 (those months of the year) but only 20% in the winter. This is because the probability is computed over a weekly 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. Fate and behavior of Spilled Oil (DEIS at 9-4-87)

We are pleased to see that HMS included a section on the fate and behavior of spilled oil. Unfortunately, the discussion is quite limited, and some inaccuracies exist.
First, we disagree that most blowouts would be a surface spill. Using drilling, jackups, or semisubmersibles, the most likely blowout form would be a subsea spill. A subsea spill would not be a surface spill. The subsea blowout would probably be either another or subsea.

Second, we believe that subsea blowouts would probably be either another or subsea. The subsea blowout would be a surface spill, as well as a subsea blowout. Subsea blowouts would probably be either another or subsea.

We believe that the surface blowout would be a surface spill. We believe that the subsea blowout would be a subsea spill. We believe that the subsea blowout would be a surface spill. We believe that the subsea blowout would be a subsea spill. We believe that the surface blowout would be a surface spill.

The DEIS repeatedly states that even the largest of spills (4,500,000 barrels) would not have a significant ecological impact. The DEIS never explains what ecological impact would not be significant. The DEIS never explains what ecological impact would not be significant. The DEIS never explains what ecological impact would not be significant. The DEIS never explains what ecological impact would not be significant. The DEIS never explains what ecological impact would not be significant.

The US Environmental Protection Agency (EPA) estimates that the average ecological impact of an oil spill is approximately 70,000 barrels. The EPA estimates that the average ecological impact of an oil spill is approximately 70,000 barrels. The EPA estimates that the average ecological impact of an oil spill is approximately 70,000 barrels. The EPA estimates that the average ecological impact of an oil spill is approximately 70,000 barrels. The EPA estimates that the average ecological impact of an oil spill is approximately 70,000 barrels.

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Sihler events could take place if an oil spill occurred in the North Atlantic Ocean region. Oil spills could remain at sea for long periods (months) before coming ashore, or it could get into the shallow, coastal ocean. Instead of being immediately dispersed, these oil spills could have catastrophic effects on a range of important resources as they are driven here and there by winds and tides. The DEIS misses just the opposite impression. As we stated previously, oil at sea is barely acknowledged as an impacting factor, and we believe that this result 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 19 shows, however, that evaporation accounts for roughly 1%. At 10 days, evaporation accounts for only 1%, while dispersion into the water column accounts for more than 2% of the oil. Over 85% of the oil remains either floating or in the water column at 10 days.

Despite this, the DEIS repeatedly stresses that an oil spill is a problem only during the first few days after the spill. Howarth (1995a) states:

"The DEIS concludes that weathering of an oil spill reduces its toxicity very rapidly and so the immediate impacts of an oil spill need to be considered. This is incorrect. Table 11 of the DEIS states that on day 10 the toxicity of the oil surface remains toxic to organisms for approximately a week (p. 11). Later, the DEIS states that "oil on the water surface remains toxic to organisms for approximately a week" (p. 11). These assumptions are supported by the results of the DEIS. For instance, immediately after the oil spill, the oil on the water surface remains toxic to organisms for approximately a week. The DEIS states that "oil on the water surface remains toxic to organisms for approximately a week" (p. 11). The oil on the water surface remains toxic to organisms for approximately a week.

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 Howarth, as cited in the DEIS. The oil on the water surface remains toxic to organisms for approximately a week. The oil on the water surface remains toxic to organisms for approximately a week. The oil on the water surface remains toxic to organisms for approximately a week. The oil on the water surface remains toxic to organisms for approximately a week. The oil on the water surface remains toxic to organisms for approximately a week. The oil on the water surface remains toxic to organisms for approximately a week. The oil on the water surface remains toxic to organisms for approximately a week. The oil on the water surface remains toxic to organisms for approximately a week. The oil on the water surface remains toxic to organisms for approximately a week. The oil on the water surface remains toxic to organisms for approximately a week.
centrations of dissolved oil, including toxic aromatic hydrocarbons, rose 0.5 above background levels for at least 5 months (Sow et al., 1974; Firestone and Drake, 1975).

In the case of oil spills, two factors which likely contributed to the long residence time of this dissolved oil - low temperatures and low winds - would also be expected to be important in the area near the FEP. Low temperatures and low wind speed would moving less oil into the water column, which in turn would decrease the amount of oil released to the water column. The toxic components are much more slowly lost than they are from a surface slick (Vandemolen, 1972).

Obviously this also results in inaccuracies in the impact analysis. Since the FEIS assumes that the toxicity of oil will be very rapidly reduced, it generally considers an oil slick to be degrading only if it encounters an important resource area within 3 days (see the analysis for Fort Miller: pp. IV-8-17, IV-8-18, and IV-8-34) or within 10 days (see the analysis for Vessel O-2: pp. IV-8-11, and Unknown: pp. IV-8-11) of xE. Increasing the time of concern to 30 days greatly increases the likelihood of with oil (Table IV-9 of the FEIS). In fact, the cumulative risk of a spill contacting land within 30 days is estimated at 37% (Table IV-9). IMS does not even attempt to model oil spills behavior beyond 10 days because of the difficulty. Table 4-12, yet the actual time of concern may be many months. This result in a serious underestimation of potential effects, and should be corrected in the FEIS.

Another concern centers around the effects of photosynthesis of applied oil. Oil at sea would be exposed to ultraviolet light - which accelerates the biodegradation of a hydrocarbon - which results in photosynthesis. Photosynthesis increases the water solubility hydrocarbons and produces hydrocarbonates. These compounds are generally more toxic than the original petroleum and could have an increased impact on 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 we will underestimate the toxicity of the oil. For more information on oil toxicity see Howarth (1973a) and (1973b); Fire and Howarth (1983); and Sanders (1980), copies att. med.

Finally, although the DEIS (at IV-8-14; IV-8-15; and IV-8-17) 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 mammals. (This aspect is covered more fully in our comments on these sections.) We bring it up here to remind the reader that the RBO model does not account for the mesohaline ARCA, nor does it model the movement of oil through the water column. This model also does not account for the additional information, the impact analysis cannot adequately address the effects on benthic organisms or their predators.

For more information on factors affecting oil transport to the bottom and the possible impacts to fisheries, see Howarth (1975b) and (1975b); Howarth and Heaf (1984); Howarth (1981); and Sanders (1980), copies att. med.


Note: The text is a mix of French and English, focusing on the effects of oil spills on marine life and ecosystems.
Responses 6-1
Table 5-1 presents a summary of overall effects for each topic based on the probability of contact with specific biological resource areas, rather than those effects that would occur in 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 supplementary footnotes that point out the limitations 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 lesser 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 exists because of its large resource area that extends 25 miles offshore. As explained in Section 4.3.1.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 20 percent probability of oil spill contact over the entire tanker route from Saldan Bay to ports in the U.S. West Coast over the 25-year life of the field.

Response 6-2
A general statement concerning the purpose and authority of information to lessees (20\(^{th}\)a) precedes these measures in Section 7.2.0. These advisory measures serve an important function in alerting the lessees to specific environmental concerns. In most cases, the lessees conducted operations according to these recommendations, environmental risks would be decreased.

Important elements of information to lessees are incorporated into each lease's Exploration Plan/Oil Spill Contingency Plan, which is subject to NOAA approval. In addition, the Exploration Plan letter of approval reiterates these important elements, which become binding conditions on the lessees. In the experience of the NOAA, lessees conducted operations according to these recommendations contained in these mitigating measures.

Areas of special biological sensitivity are considered in the oil-spill-impact-occurrence plan requirements of OCS Order No. 7, which essentially implies the same enforcement authority as a stipulation. The IUL regarding bird and marine mammal protection was not made a stipulation. Other agencies (FAA, U.S. Coast Guard) regulate aircraft and vessel connections. The IUL 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 the Leseak Lagoon under visual-flight-route (VFR) conditions emphasize the need for both the PMO and the lessees to assume responsibility for assuring that all contractors and subcontractors are familiar with recommendations in the IUL 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.1. of the FEIS, and an analysis of the potential effects is included in Section IV.B.1.a.(2) (see the St. George Basin [male BY] FEIS for additional analysis of Unimak Pass).

Response 6-5
The pipeline corridor across the Alaska Peninsula to a pipeline-terminal site at Saldan 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. Beluga, 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.
The paragraph concerning feeding behavior is substantially altered by General Permit 1983 (GP-83), which does not include northern Bristol Bay because these species are very unlikely to experience any interaction with OCS oil activities in the lease area, and the work by Kent et al. (1983) on gray whale avoidance of oil. This statement makes it appear that the lease area has not been properly surveyed for oil impacts on whales, and the remaining text does not appear to refer to the same type of data. A complete discussion of seismic effects on bowhead whales appears in Sec. IV.A.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 as migrating gray whales (Sec. IV.1.).

The statement of concern reads as follows in the EIS:

Other potential effects on cetaceans include marine disposal of drilling mud, 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 nondamaged cetaceans during exploration.

The Environmental Protection Agency's NPDES permit regulates the amount of discharges into the marine environment; it also permits the EPA to determine that a discharge is harmful. Therefore, since EPA determines (through its NPDES permit) the acceptable discharge levels of formation and cooling waters, and dredging/filling activities, these activities act as a minor influence on nondamaged cetaceans. Facility siting and secondary development must meet the requirements of local planning boards and satisfy CDM requirements. This is due to these controls, the aforementioned projects should not have a minor influence on nondamaged cetaceans. Finally, seismic activities are permitted through the NPDES permit, 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 Negra Negro did not result in a decline of values, only a decrease in use of the lagoon while extensive dredging was ongoing.

This EIS overstates the effects of oil spills and other potential effects of OCS activities on plant species, such as the ice seals, and spotted, bearded, and ringed seals, which rarely occur in the lease sale area (see Graphic 1), which does not 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 also points out that species (such as sea otter) that are likely to have some interaction with OCS activities and that could sustain some population-level effect.

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 inimical 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 oilied, 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-slick contact).

The analysis for sea lions contacted by oil takes into account any environmental stressors such as disease, injury, or food depletion, which 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 con-
tacted 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 area would be far removed from the general distribution of northern fur seals to be of any consequence, regardless of this species' population status.

Response 4-13

This EIS indicates that fur seals could be seriously affected by oil contact of the type described in Section 7.3.1.4.2 (Situation of Oil) of the FEIS states: "Sea otters, fur seals, and newly born seals were expected to suffer mortality from oiling through loss of fur/water repellancy and subsequent loss of thermoregulation 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 4-11. Section IV.8.1.a.(3) addresses the cumulative effect of the St. George Basin lease sale on northern fur seals and comments that major effects on northern fur seals are possible.

Response 4-13

There is justification for the assessment that a maximum of 400 to 700 otters could be oil washed and killed by a 2,000-barrel spill spread over a 100-km² area as discontinuous patches of oil. (Sec. IV.8.1.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 rates of more than a few hundred animals. A raft of 3,000 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 commenter suggests, were 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 estimate 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 sea otter population, the same effect level estimated in this EIS.

Response 4-14

Although spill reactions from noise can have harmful effects on pinnipeds and sea otters other than the disturbance of pinnipeds' activities, the number of individual sea otters 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 area at any one time. A study on the effects of seismic noise and seismic vessels' presence on sea otters by Helmman (1983) (as cited in NOAA) Baranak 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 commenter suggests. An OCS-related incremental increase in air and boat traffic (3 helicopters/day; 2 to 6 supply vessels 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. Helmman'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, the IEL 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 4-15

The FEIS analyzed the effects of tankeriking 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 7.3.1.4.3 and Table II-2 of the FEIS.

Response 4-16

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
summing 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 sim-
ulating 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 Valle et al.
(1983), who found that migrating gray whales some-
times react to seismic noise. Definite reactions by gray
whales were found only when 'average pulse level' was
at or greater than 160 dB re: 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 (Trinter 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.C.
(Worst-Case Analysis) of the EIS.

Response 6-18
The question taken by the commenter from Thorsteinson (1986)
relates to migration rates for the migrating juvenile salmon. The
text of the EIS (Sec. III.B.1.), however, discusses spawning
migration rates as summarized in Thorsteinson: "Stray " (1986)
estimated migration rates from the shelf edge (200 m isobath) to
the mouth of the Kvichak River; a distance of 1,359 km, during
the last 30 days of the spawning migration to be 45 km/day for
sockeye and chum; 56 km/day for chum and coho; and 69 km/day
for chinook."

Response 6-19
Information summarized in Section IV.B.1.e.(1) (from Thorsteinson,
1986) is very general life-history information that applies to the
different species in the area. Although specific information on
juvenile migration routes and timing has been described to 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 FES. 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
further north. Outmigration along the northern side of the Alaska
Peninsula (including fish from NuNivak Bay and Kvichak Bay) is
indicated by the two arrows leading into the heads of shading that
indicate relative abundance 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 EIS). Harvest data are
presented in Section III.C.1.

Response 6-22
The unbroken arrows on Figure III-7 of the FES (Fig. III-6 of the
DEIS) (Thorsteinson, 1986) indicate known migration routes. Based
on this figure, the chumook spawning-migration route was summarized
very generally as "some distance offshore through the Bering Sea
ward their natal streams along the Alaska Peninsula and Bristol
Bay (Fig. III-4)" in the DEIS. Although the information on migra-
tion 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 EIS).

Response 6-24
The commercial value of capelin is not discussed in Section
III.B.1. (Fishing Resources) (see Sec. III.C.1. Commercial
Fishing Industry).

Response 6-25
These concerns are addressed in Responses 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
the Bering Sea would physically cover up to 20 km² (Sec.
IV.A.3.e.). The actual area covered by the slick would be about
twice greater, with 90 percent of the slick surface being open
water rather than oil. The commenter 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 commenter is confusing the term "slick" as it moves across the ocean by 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 100-km² area for a 100,000-barrel spill, which is provided in Section IV.A.3.e, and Response 6-38, 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-km² 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 local populations rather than local stocks. Based on these definitions, minor to moderate effects on regional populations of fisheries resources could occur. Serious localized effects could occur on localized stocks that constitute a portion of the local population. 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 life stages 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. The Nahak-Kirk River system stocks because oil spills are not expected to contact areas where these stocks occur.

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 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 equates to a concentration of 0.6 ppm down to a depth of 350 meters. This concentration was incorporated into the analysis in Section IV.3.b.(1) of the EIS.

Response 6-30

The statements on Page IV-B-2 in the EIS as to a weak or 30- 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 OCSMP studies and in situ measurements of subarctic weathering by Payne (1983, 1984). Payne demonstrated that for individual compounds, a significant decrease in slick concentrations takes hours to tens of days. Because of this difference in the rate and because the bulk of these low-molecular-weight compounds is lost within 3 days, a January 1983 NOAA OCSMP/Alaska OCS Office EIR 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, 1983). 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 of aromatics 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 (1983) 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 500 kilometers. These estimates ignore any losses of dissolved hydrocarbons to the atmosphere that would further decrease dissolved hydrocarbon concentrations (Cline, 1983).

Note that in the above analysis, the decrease in water column concentrations is by dispersion, that is by mixing and dilution, but not by removal of the hydrocarbons from the water. The commenter should be aware that there is a difference between dilution and physical removal of hydrocarbons from the ecosystem; i.e., the reference to Vanderweilen (1982). Once diluted, degradation of
dissolved hydrocarbons will be slow, partly because microbial decomposition is slower at low 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, and it is expected that levels would be expected in the subarctic and arctic (see Response 6-16). Also, photo-oxidation is not expected to appreciably accumulate toxics 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 LC50 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 LC50 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 life stages upon contact by oil dissolved in the water column, regardless of concentration. Table 14-14 merely indicates observed ranges of concentration that have produced effects in laboratory bioassay studies. The EIS does not imply that these concentrations (LC50) from laboratory exposure 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 scenario to portray the probability of an oil spill occurring and contacting a specific location (target) from all launch points specified in the OSHA model. Thus, final probabilities are better representatives of the risk to a given target from developing the estimated resource base of oil spills for the case. Refer to Response 3-2 for an additional discussion of this concern.

Response 6-35
As indicated in Response 6-18, 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 toxic effects 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 6-36
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.B.2.c., and the recommended language has been added in the EIS.

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 Hiert et al. (1980),
there is another observation where there was little contamination of benthic sediments following the Argo Merchant spill (Huclo et al., 1983).

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 LC50 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 NWS 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 commentator has not provided the essential rationale to support a major effect for pelagic salmon. Response 6-26 refutes the argument that the area (200 km²) underestimated 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 LC50 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 NWS does not agree with the point upon which the IFA 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 probability of an oil spill of 1,000 barrels or greater contacting the Nelson Lagoon and Port
Moller/Barr River areas are 9 and 3 percent, respectively. Probabilities for nearshore areas in lower Bristol Bay are less than 0.5 percent.

The derivation of a 300-nm² area for a 100,000-barrel spill is given in Section IV.A.1.b. A 100,000-barrel crude spill in subarctic waters would physically cover up to 30 km² (Sec. IV.A.1.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 commentator 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 makup for the additional thickness. Second, the commentator 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 definitions presented in Table 5-1, and these definitions focus on regional populations rather than local stocks. Based on these definitions, serious adverse effects on regional populations (including 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 of oil on the ecosystem in the event that a spill contacts a nearshore area, based on combined probabilities, however, this appears unlikely. The analysis further assumes that vulnerable habitats would be present when a spill contacts the nearshore area.

The analysis in the EIS does not support much findings that major effects would occur in the Naknek/Bright River system stocks because of the low probabilities of oil-spill contact to areas where these stocks concentrate (less than 0.1%).

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. An offshore crude spill in the vicinity of Pukchuk Inlet could produce higher concentrations of hydrocarbons near the mouths of spawning streams around Herendeen Bay (Sec. IV.B.1.a.(1) of the PEIS). 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 PEIS (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 PEIS), the information on oiling migrating juvenile salmon has been clarified as being specific only to sockeye. Use of the values has been amended 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 PEIS) has been amended to address this concern.

Response 6-66
This concern is addressed in Response 6-74.

Response 6-67
Final probabilities are more appropriate representations of risk than conditional probabilities; therefore, they do not "downplay" the risks (refer to Response 6-36). Oil spills are anticipated to remain toxic for long periods (refer to Response 6-30).
Pink chum salmon are more likely to be affected by an oil spill contaminating Iliamna, Humpet Lagoons and Beringia Bay than sockeye and coho salmon because they can spawn intertidally.

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; Undermøllen, 1982) which would result in a limited number of mortalities on adult and juvenile salmon (which have LC50 values of 1 to 3 ppm), rather than lethal effects on a large portion of the salmon migrating through the pass (as purported by IFA). 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.

As indicated in Response 6-14, 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.

This concern is addressed in Responses 6-30, 6-48, and 6-59.

The text has been amended to incorporate the information in this comment (Sec. IV.B.1.a.(3) of the FEIS).

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

This concern is addressed in Responses 6-26, 6-28, and 6-31.

The cumulative-case effect is expected to be minor, which is the same as the overall effect expected for the proposal.

The paragraph cited by the commenter 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 Alaskan Basin.

The probability of an oil spill occurring and contacting Port Hugely is 17, 20, and 24 percent within 3, 10, and 30 days, respectively. The probability of an oil spill occurring and contacting Port Hugely 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 oil spill expected to occur from this proposal (refer to Response 6-34). Therefore, the MMS does not agree that major effects are likely.

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 Northwestern Bay within 30 days. The conditional probabilities indicate that, if a spill occurred, there would be a less-than-50% probability of contact for the area between Egegik Bay and Northwestern Bay for 3-, 10-, and 30-day trajectories.

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 Heden 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 Heden 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 barrels of oil for the North Alaskan Basin. The conditional probabilities reveal a less-than-0.5-percent probability of contact within 10 days and a 15-percent probability of contact within 20 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 NES 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 Moller 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 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 Menden and Port Moller would be contacted by a single spill.

The text has been amended in the FEIS to address the concern over possible aerialization 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 effectors 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 Menden are 5% and 7 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 commenter is referred to Responses 6-28 and 6-94 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 NES disagrees with the conclusions of the commenter regarding the effects on groundfish. The commenter is referred to Responses 6-26, 6-34, and 6-59.

Response 6-91  
The concern regarding lethality of 5 to 7 ppm on adult groundfish is discussed in Response 6-31. A discussion of the derivation of the 300-ha² area is present in Response 6-36. Because the oil-spill risk in the cumulative case does not increase over that of the proposal, effects on vulnerable life stages 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.1.b.), the combined prob-
abilities 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 life stages of groundfish. Because of this, the
effects of the cumulative case in nearshore areas, which are used by
egg, larval, and juvenile life stages 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 for this 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 site would have the potential to affect surf
crab resources on the southern coast of the Alaska Peninsula only
during the very limited annual spawning season. Surf crabs, 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 Seaview-to-Port Helden 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 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.

The FEIS indicates that a major spill that contacted the Port
Heller/Port Helden area when ovigerous females, larvae, and JUve-
nile 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 1,714,000 tanner crab were harvested on the southern coast
of the Alaska Peninsula; of this total, only 47,416 tanner crab-
about 3 percent of the total—were caught in Beaver/Julius 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 FEIS.
Response 6-105
The rationale for using combined probabilities as indicators of oil-spill risk is identified in Response 6-39.

The text has been modified to indicate that "... within 3 days when sea ice is 0.5 to 1.5 m thick is likely to be high enough to cause mortality to all life stages of red king crab" (Sec. IV.B.1.a.(1) of the PRI).

Response 6-106
The text (Sec. IV.B.1.a.(1) of the PRI) 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-0.3-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 PRI) has been modified to include separate analyses for red king crab and other invertebrates. The analyses conclude that a major spill (100,000 barrel) contacting nearshore areas where vulnerable life stages 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 LC50 value for adult crabs is 1 to 4 ppm (Table IV-13) and not 0.1 ppm, as the commentator implied. Further discussion of the use of LC50 values is presented in Response 6-31.

Response 6-111
This concern is addressed in Responses 6-14, 6-26, and 6-27.

In addition, the NWS 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 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 commentator. 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 on very high probabilities, to about 1 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 these, 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 ice targets and 200 land/boundary segments. Most OSRA runs are limited to a maximum of 31 notional 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 Mohotinou southwest to Point Heiden, 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 northern regions because the wind stress between air and ice is greater than air over water. This is particularly true in the marginal ice zone, where ice cover is broken down 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 4-112

This concern is addressed in Responses 4-14, 4-17, 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-based 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 billion 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.8.6.).

Response 4-113

The MMS does not use Alaskan, nor-OCS spill statistics to calculate oil-spill risk. The summary of Alaskan spill statistics has been included to show frequent requests that the spill risk be portrayed, and to counter the misconception that Alaskan environmental conditions result in more frequent oil-industry spills.

The commentor gives no statistical basis for the premise that "characteristically the years of declining production are also years of spillage reports." Such a premise is inconsistent with either OCS or Alaskan spill records. Both Alaskan and OCS records indicate a decrease in spillage reports since the early 1970's, regardless of whether individual spills 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 spills are less hazardous in relation to oil spills than offshore fields. The Alaskan statistic in Section IV.A.6.B. of the EIS lists 1 or 2 platform spills for Prudhoe Bay/Yupukak 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 (Broidy, Army Corps of Engineers and Environmental Research and Technology, Inc., 1986). Tanking of Prudhoe Bay/Yupukak oil at the far end of the pipeline is via at-sea vessels, as is all OCS tanking.

Reporting requirements for tanker spills are based on international treaties and conventions and are quite similar to those of U.S. requirements for foreign tankers and U.S. tankers. (Note that a function of vessel nationality, but rather of in 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 4-114

The pipeline-transportation scenario for the proposal would pipe North Aleutian Basin oil to a terminal on the southeastern side of the Alaska Peninsula, where it would be tankedared through the Gulf of Alaska—not through the Bering Sea (also see Response 4-14). Industry has tankedared over a Bibit of North Slope crude through the Gulf of Alaska without any 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 analyst to assume that tankers carrying North Aleutian crude would have zero spills. The EIS also has included an offshore-loading-transportation scenario for Alternative 1. Oil would be offshore loaded and transported by tankers through Inskak Pass to markets. The oil-spill-risk analysis for this transportation scenario is contained in Appendix V.

Response 4-115

The text has been expanded to include more information on the stochastic wind model used in the oil-spill-trajectory modeling Section IV.A.6.B. of the FEIS. However, the reader is referred to Liu and Landers (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-slick trajectory analysis are updated as new information becomes available. Much of the data compiled from the Bering Sea Offshore Comprehensive Oceanic 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 contractors, the data base will be updated. The lack of specific data in the existing data base does not, however, prejudice 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 Schmacher and Noon (1983) to be more important on the northern side of the Alaska Peninsula than on the northern side. Owing to differences in importance across the peninsula is one reason why the inclusion of orographic effects is more relevant to trajectories for the northern side of the peninsula than within Bristol Bay. In addition, Schmacher and Noon considered the orographic effect to be directed predominantly offshore north of the Alaska Peninsula and to be of more importance on the north side of Bering Bay and thus this study is focused primarily on the Kuskokwim River at Port Heiden and elsewhere along the northern side of the Alaska Peninsula.

What this implies about the trajectory model is quite clear: where these orographic effects occur (particularly at Cold Bay and Port Heiden), the model will slightly overestimate the likelihood of land or shoreline 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 minus the orographic winds rapidly dissipate away from the peninsula passageway.

Response 6-118

The Rand model corrects for sea breeze (Liu and Leendertse, 1983).

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 these trajectories are summed, not averaged. If 6 of 60 trajectories from individuals, hypothetical launch points reach 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 ORA is to calculate the trajectories of oil slicks and the probabilities of land and resource area contact with a discrete slick. These 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, 1982c). Weathering effects 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 6-75); because the EIS is concerned with spills of possibly order-of-magnitude difference in size; and because spills usually disappear within 10, much less 30, days regardless of all characteristics (see Response 6-74); the information gain would be negligible relative to the accompanying increase in complication 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 50 years, much increased complexity is not desirable.

Instead, use 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 ORA, and additional sources in arriving at estimates of oil-slick effects on biological resources.

Response 6-121

This concern is addressed in Responses 6-74 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 or 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 many contact is over the vulnerable quarter of a year.

Response 6-123

Additional information on wavenotes blowouts has been added in 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 (UBER, 1968). Production-platform blowouts usually, although not always, occur above the water line.

Response 4-124

The derivation of a 200-km² area for a 100,000-barrel spill is given in Section IV.A.1.e. A 100,000-barrel crude spill in arctic waters would physically cover up to 200 km². The actual area of slick conforms to tenfold greater, with 10 percent of the slick surface being open water rather than oil. The commentor argues that the arctic is unique. First, arctic and subarctic crude spills are orders of magnitude thicker than spills of the same waters. Therefore, they also would spread to 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 4-125

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 and which has a higher asphalt content and 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.1.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 physical contact with the oil slick, toxicity, then 3 days probably is appropriate, except perhaps in areas with a 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.1.8.1.(c) of the EIS as to a week or 10- to 12-day persistence for aromatics like naphtha were based on assumptions made during an early St. George Basin synthesis meeting which is now recognized as overly conservative by the original authors.

The St. George Basin synthesis meeting occurred prior to completion of OCSMP studies and in situ measurements of subarctic waters 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 OCSMP/Alaska OCS Office/ NLRI 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.

Clime (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 loss of dissolved hydrocarbons to the atmosphere, which would further decrease dissolved-hydrocarbon concentrations (Clime, 1982).

Note that, in the above analysis, the decrease in water-column concentration 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 Vandersluis (1983). 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 4-126

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 6-121). Also, photo-oxidation is a relatively very slow process; the production rate of photo-oxidized toxic is slow and no appreciable accumulation of such toxic would be expected in the open sea (see also Response 6-125). Also note that studies by Payne (1961, 1964) referenced in this EIS were conducted out of doors under in situ subarctic conditions.
March 13, 1983

Mr. Al Powers
Manager, Alaska GCS
Minerals Management Service
P.O. Box 10115
Anchorage, Alaska 99510

Dear Mr. Powers:

Attached are the comments of Nunam Kitlutsisti on the Draft EIS for Lease Sale #21, North Aleutian. I regret that our comments are not more complete, but time was of the essence in getting our comments to you.

The most important and missing omission with the document is the fact that the DEIS analysesamba impact only for the lower Alaska Peninsula communities. Salmon, herring, marine mammals, and birds migrate through this lease area to maintain all around Alaska, or our area salmon, herring, waterfowl and marine mammals - all of which migrate through, feed, or nest in the areas under discussion. This is part of the 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 80 of P.L. 98-581, ALASKA. We strongly urge that this analysis be done in the final draft.

In closing, I wish to state that Nunam Kitlutsisti is the owners of Unalik Fishermen of Alaska on this DEIS and urge you to delay this lease sale.

Thank you for this opportunity to comment.

in peace,

Herald Spark

CONTENTS OF NUNAM KITLUTSI\TI ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR LEASE SALE #21, NORTH ALEUTIAN SHELF

III-D. Biological Resources

1. Fisheries Resources

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 area, and northern movements of these species out of the leasing area.

The RMS has arbitrarily drawn lines in the ocean, and asked all observers to focus on a specific site in the ocean. RMS rejects any suggestion that cumulative impacts throughout the migratory range of the salmon may lead to cumulative changes in migration pattern and/or increased ocean mortality.

By limiting its DEIS investigation to the area of projected #21 leases, RMS intentionally limits impacts to a small ocean space, and reduces risk to existing users and their users. This error is critical in any public policy discussion focusing on net national worth resulting from the planned activity. By excluding areas outside the Lease Area, then postulate worthwhile net profit resulting from national dedication of this biologically rich ocean area to oil and gas development.

Tag studies completed in 1999-60-61 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 Asian-Kuskokwim Delta, areas north of Bristol Bay. This vast region supports over 2000 commercial salmon fishermen, and over 4000 subsistence harvest families.

RMS and oil companies maintain that little harm will come to fish from daily oil operations, or worst case scenario of multi-day blow-outs. RMS incorrectly characterizes all salmon fisheries potentially impacted to be of the dominant non-ayuooq salmon population.

We question the continuing wisdom of RMS to state that a lease of few salmon will do little harm. Fisheries resources in Northern Bristol Bay and the A-Y have been significant, recent years. The conservation needs of these species and increasing awareness of the importance of the Unimak and False Pass areas will be an additional financial hardship.

Under Title III of the DEIS 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 claim the benefits of the fund.
designs. Indirect take by altering migration patterns, or reducing critical seasonal habitats thereby increasing ocean mortality is not currently monitored to be subject to claims under this Fund.

The list of unknowns in the Arctic. In fact, the recently enacted Arctic Research and Policy Act of 1984 established Congressional oversight on issues in unknown than is known about warming Arctic. These unknowns lead to the extensive listing of stipulations and surveys that are 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 American continental shelf, the oil and gas, our villages, this Congress, and the public, have been told that the legacy of National-Administrative decision-making would be made toward environmental protection. It would not be until the latest stipulations, to the Secretary's ability to halt all OCS development activities that 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 flaxseeds pay very close attention to what anybody outside the area of the National Environmental Policy Act. Federal, state and wildlife agencies have never visited an Arctic OCS platform to monitor compliance.

RBS writes a type of Stipulation #4 in all leases to hold all parties on paper to strict standards to conserve wildlife while conducting OCS exploration. This stipulation also requires on-site biological monitoring. One of the standard provisions if required by RBS is that developers must "operate during these periods of time that do not adversely affect the biological resources as established by RBS, or modify operations to ensure that significant biological populations or habitats deserving protection are not adversely affected.

Regulate extremely concerned how ARCO was going to comply with Stipulation #4 in its Newarin Basin. Sale #83 leases. ARCO responded with the following.

"There is apparent confusion over the intent and purpose of Stipulation #4 and our responsibilities under the Arctic.

ARCO states that all RBS requirements ARCO to be side-scan sonar and acoustic profiler data reports to determine if structural/ biological policy that are being presented. In addition, is on garments.

There is concern that Santa Barbara type storm conditions do not occur in Arctic. Artist does not require biological monitoring even for endangered bowhead whale."

(Cite ARCO answer to State question #6 on ARCO-EB)

The RBS never asked, and as ARCO states, industry never voluntarily offers biological monitoring before or during operations. The magnitude of the unknowns, and the future values of fish, how is anyone going to know if no one looks. In specific regard to Sale #83, American fishermen operating through joint ventures have caught thousands of metric tons of fish. Salmon from above 100,000 by their traditional "kill" catch. Yet, will anyone ever know if no biological surveys are ever undertaken.

Failure to identify potential losses in an economic exchange is ground for re-writing an EIS.

Further examples of RBS and Industrial harm of National resource values abound.

In 1983 distant government routinely granted a seismic permit, and listed stipulations to conduct exploration. The seismic operator to cut costs, used dynamite inside the Cite River and up and down the mainline. Witnessed RBS that fish were found floating; their air bladders exploded; bearded seals and walruses either killed or极大压力被感化. There was no evidence of the explosions. Although the villages went without food, no change in RBS operations on seismic was undertaken. Same equal trade. See "The Issue is Survival." Page 11.

In 1984-85, in preparation for Norton Sound Sale #87, over 10,000 nautical miles of seismic surveys were conducted off-shore. Government increased military exploration program. Beginning in fall 1985, bearded seals. The majority of Norton Sound marine mammals died. These villages have assaulted themselves in opportunistic locations to harvest migratory wildlife. In the knowledge of the elders, this has never happened before. Beal hunters in recent meetings have reported that through winter, 1985, they had to travel over 60 miles of offshore ice away from the area of these operations. RBS and the Industry state that there are no carcasses, they are not responsible. Cash-poor little people in the villages suffer. The lesson has still not been learned. For RBS does not require biological monitoring of marine mammals to determine impact.

Third, threatened rectify black bear use the rear weel gree bed of landscape upon as critical staging areas. Most important is the 61 migration. These bears feed up to six weeks to develop fat to support their 500 hour straight down flight to Baja Peninsula. Helicopters servicing platform in the St. George Fish Basin stationed in Cold Bay adjacent to Iskateak lagoon made repeated overflights. I have presented to the Committee newspaper articles on this issue. Once varied that their flight path and natural occurring this threatened species that Alaskans and Calimes have worked so hard to conserve, the
RHS and CSL Industry did nothing. Oil industry helicopters continued to harass the beast. Interior ordered FWS not to interfere. Interior was a violator. Many helicopters in refuge airspace. GCS is in violation. No order is needed.

VIAKT
7-9

B-2. Marine and Coastal Birds
(Cite ANPS response to State OIG on monitoring)

Northside of Alaska Peninsula is of vital importance to 145 species of waterfowl. In recent years, four species of Arctic nesting geese (Red-throated Loon, Emperor Goose, and the Pacific White Fronted and Lesser White Fronted Geese) 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; unusual weather changes; pesticides and other forms of toxins contaminating wintering areas; and predation by birds and small for bears: have all contributed to the current declines. Status of the Pacific Flyway Council, environmental groups, and interested Alaska Natives and sports hunting groups have worked for five years to fashion a comprehensive agreement that provides for the conservation of habitat, hunting, and fishing seasons, and expanded biological and habitat studies. These agreements are part of the comprehensive Yukon-Kuskokwim Delta Geese Management Plan.

One habitat zone of critical importance is Isabek Lagoon. In the spring and fall, all four species of threatened Arctic nesting geese stage to some degree. Of the two staging periods, the fall migration is most critical. Isabek lagoon supports the world's largest eiders bed.

7-B

The entire Pacific Flyway population of threatened Black Brant converge in the lagoon beginning in late September with peak numbers in mid-October. After wintering in Isabek, the brant feed for approximately 6 weeks, staging body for necessary nourishment for their chaotic oceanic flight to Mexico & Baja Peninsula. Intermittent feeding operations.

10-fall, 1983, the oil industry began preplanning for helicopter support facilities in Cold Bay. A coastal location adjacent to Cold Bay was selected as a site for the helicopter support base for IPF Instron helicopters. Interior Department was not consulted. Whereas the main loading port for the aircraft, the 7-B did not know about it.

7-9

RHS and CSL Industry did nothing. Oil industry helicopters continued to harassing the beast. Interior ordered FWS not to interfere. Interior was a violator. Many helicopters in refuge airspace. GCS is in violation. No order is needed.

The question by FWS, Alaskan Natives, the State of California, and the press. Drillers cited safety as reason for Isabek overflights, but proceed 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 RHS, nor industry made any substantial effort to halt the harassment of Black Brant. Helicopters continued to hover over Isabek and the industry questioned publicly why there was any problem. To date, FWS with industry encouragement has refused to refill IPF flight routes for Isabek Lagoon. The FWS has been ordered by policy makers in Interior Department to reevaluate future overflights as a management tool and to work out a long-term plan to relocate helicopter activities to Dutch Harbor during the period of intense helicopter utilization of Isabek.

Industrial spokesmen had participated in numerous meetings with Western Alaskan villages where monetary waterfowl populations, and habitat were discussed. Industry was well aware from meetings and fee arrangements that a problem existed with Arctic Nesting Geese. On September 8, the Refuge Manager for Isabek lagoon sent a letter to the RHS requesting that the oil industry avoid overflights over Isabek Lagoon during the fall migration as a sign of cooperation. The letter was ignored. 

Industrial干扰与critical waterfowl habitat or threatened migratory waterfowl species as significant issues to be addressed by the OGIS.

7-3.4.5.3

Respond to "The Issues in Isabek" 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. Alliteration of bowhead competing users is a subject that I did not see addressed under B-1.

C. Social and Economic Systems

RHS arbitrarily drawing lines in risk assessment. Key to this entire section is to enlarge affected communities under assumption of risk element. RHS argues that only communities located adjacent to activity could possibly be affected. I have numerous reports showing how fishing income and subsistence non-income take in the glue that hold modern rural communities together. On September 10, I visited the interior Department and asked for an enclosing for your review copy. This is to consecrate for the weekends, a new marine industry, and an exciting conversion from subsistence to a business to a non-income.

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moving "hot spot" for primary production that serves as
a refuge for the remaining Bering and matonic systems in
the Bering Sea. Conservation of these biologically rich
areas would impact not only local subsistence users of these
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migratory wildlife forms.
Response 7-4a

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 7-4b

Information on the migration routes of the five species of Pacific salmon in relation to the North Aleutian Basin is summarized in Section IV.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 especially 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 arbitrary draw 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. Furthermore, the analysis of cumulative effects on biotic resources in the EIS assumes that other Alaska OCS lease sales in 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.(3) of the FEIS clearly state that "the various lifestages of all five species of Pacific salmon (emphasis added) may be affected..." A whitepotch salmon comprises the major species (in number) that is indigenous to the North Aleutian Basin, the potential for effects on other salmon species 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 "lifestyle" of fish; in commercial harvest, in the harvest of the sealion. 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 commentator that increasing subsistence-use demands here 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 (RFDO), 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 (ESBF) will be asked to make recommendations to the RFDO in the enforcement of Stipulation No. 4. The RFDO utilizes all available sources— including recommendations and information from the ESBF, 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 RFDO, who would determine the nature of actions to protect the resources after taking into consideration available information and recommendations from the RFDO.

The MMS considers the recommendations from the RFDO especially important because they provide for an independent analysis from a group of individuals who are extremely knowledgeable 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 mon-
toring takes into consideration the limited duration, limited scope, and widely spaced aspects of exploratory operations in addition to being conducted on only a few occasions. The need for any modification of these plans will be reevaluated should development or production activities be proposed.

Exploration 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.

The MMS has recently submitted a draft proposal to the NMFS, the NNFWS, 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 some having no harmful effects, have been used to fish beyond a short distance from the detonation. Effects of such 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 lease sales. 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' recommendations regarding avoidance of bird and whale concentrations, the problem of helicopter overflights of Isereak Lagoon was resolved, in part, by agreement between refuge personnel and the fish-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 in boundary waters and on the Outer Continental Shelf, 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 stipulations, and Information to Lessees (ILT's).

This is accomplished most directly through a listing of stipulations, ILT'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 VTR flight corridors and altitudes. The MMS also recommended that the lessee contact FAA Air Traffic Manager and Isereak 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.1.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 temperatures, 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.(a) of the FEIS (Sustenance-
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,
Menokokia, 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 Atuamut Basin lease sale area is situated approximately 190
miles from Cape Newness, 260 miles from Muktik 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 commenter (industrialisation, 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.(a) and Section IV.N. of the FEIS. For
example, the analysis for Unalaska suggests that "increased compe-
tition for locally available subsistence resources, in conjunction
with a potential reduction of habitat resulting from the construc-
tion of added community infrastructure, could cause the need for
increased local harvest regulation and a resultant need for in-
creased 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
subistence-use patterns on specific communities could be realised
if an oil spill were to contact coastal habitats or have or redist-
tribute marine resources within community subsistence-harvest
domain." These few brief examples are given to show that the
types of factors suggested by the commenter are presently contained
in the subsistence analysis.
Mr. A. Powers
Regional Manager
Minerals Management Service
P. O. Box 102155
Anchorage, Alaska 99510

Dear Mr. Powers:

The Alaska Oil and Gas Association (AOGA) is a trade association whose major concern is for the bulk of oil and gas exploration, production, and transportation activities in Alaska. AOGA is pleased to offer 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. We are confident the DEIS meets or exceeds all requirements 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 B-2 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 discussions with MMS, the proposed study area for OCS Sale 92 was reduced to approximately 5.5 million acres. This area is the planned lease planning area and lies generally in the southwest portion of the North Aleutian Basin (ref. p. 4-10 of the DEIS).

Further action toward completion 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 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 Federal Register, Federal Register 49, No. 47, Monday, May 8, 1984, the REIS area evidenced interest in all OCS areas and shift in resource potential of the 13 planning areas offshore Alaska. Compared to the industry ranking, the Minerals Management Service has assigned an inconsistent 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 last. 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 expedited 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 DEIS 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 number of facilities required. We ask that you analyze and comment 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 in target areas. We suggest that the oil spill risk analysis be re-evaluated in light of our detailed comments.

AOGA 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 critiques that follow 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,

WILLIAM W. HOPKINS
Executive Director

MR#:tp6:646
Attachment
Figure II - C-2

The transportation scenario portrayed on this figure shows a circuitous offshore pipeline route through Port Moller, and Savonos Bay rather than a more technically and more economically prudent direct line landfall. Typical offshore pipeline units are significantly more expensive to purchase and construct. No such routing would be avoided were possible.

Page II - D - 5, Paragraph 5

The promotion of offshore loading "by developing the development of sufficient pipeline capacity" is inextricable and could preclude the development of marginal fields. Even with major trunk pipelines in place, it may be unattractive to develop fields that are remote from such trunk pipelines if long line rates 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 those stipulated in paragraph 3-3, the DEIS stipulation 5, should have a sound "pragmatic and analytical basis.

Page II - C - 8, Second Paragraph, Middle, and II - C - 10, Last Paragraph, Statements

"Lessees are advised that operations, including seamount 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-4-6 (second paragraph) that the NMFS (in a Task Force report on gray whale off California) believes that no evidence was found to support that airguns and other nonacoustic sources cause injury to marine mammals, including gray whales; and 2) that, although the presence of offshore drilling does not constitute "harassment" of migrating gray whales, as defined under the Endangered Species Act.

The NMFS also states on page IV-4-6 (second paragraph) that the NMFS (in a Task Force report on gray whale off California) believes that: 1) no evidence was found to support that airguns and other nonacoustic sources cause injury to marine mammals, including gray whales; and 2) the presence of offshore drilling has not constituted "harassment" of migrating gray whales, as defined under the Endangered Species Act.
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

The two-paragraph section entitled "Information on Endangered Whales" was repeated. The redundant paragraph should be eliminated.

Page II - C - 10, First Paragraph, Line 2

delete "intends to" and insert "may". The REPO has the discretion to limit or suspend noises producing operations if whales are being disturbed. The note "intends to" may be construed to reduce the discretion of the REPO 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 REPO.

Page II - C - 11, Fourth Paragraph, Line 12

Delete "especially where the probability of an oil spill is comparatively high". This phrase is not necessary because it is implied in the sentence, and it makes the sentence overly complicated. "...probability is comparatively high" serves only to provide an erroneous impression to the public about the likelihood of oil spills.

Page II - C - 14, Section 4, Second Paragraph

See our comment as Table - II-1, Page II-4-1.

Table II-2, Title

Please delete the word "Major" from the title of this table. This word has a specific definition in the draft EIS (Table II-3) and does not apply to this summary which includes all ranges of affects.

Table II-3, Proposed Alternative, Fishery Resources, First Paragraph, Fourth Sentence

This sentence overstates the potential affects of Sale 92 on the Port-Helleriue Fishery. Further, it seems inappropriate to include the words "in general" in a summary where it could easily take on a more definitive tone that is not intended. A sentence that states "the probability of a 1,000 bar oil spill occurring is once during the entire productive life of 1/3 from the proposed sale area, assuming a commercial discovery of oil is made," should be inserted between the third and fourth sentences.

Page III - C - X

Also, "The probability of spilled oil coming ashore during the Salmon run season 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. If the thirteen potential launch sites selected in the Sale 92 area, only two show any probability above 10 percent. If this is the case, the probability 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 approximately by the arithmetic average of all thirteen launch site conditional probabilities for such contact. Using the data presented in Table 6-1 this average is 199.5 - 35 - 111 = 120/13 = 10.5 percent. If this is a reasonable approximation for less-than 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 01 Salon on Graphic 5 in the draft EIS. There are no pipelines from other launch points. Consequently, the probability of point 01 is incorrectly portrayed as being higher than 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 affects 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 two 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 main 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 MAJDR is inappropriate in the last line of this section 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 may be INMNK at Cold Bay, but should be more significant in other regional communities. Joblessness in the Aleut region would be -9 to 19 levels, and during summer and fall, but would be -18 to 19 levels, based on 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 INMNK because: (1) the effect will be mitigated by existing and future land use and CEM plans as well as federal, state and local regulations; and (2) a large amount of land is available for new CEM elements. Also, as explained under the comment for Table II-1, footnote 7, last sentence, this land does not hold wilderness value.

Table II-3
The analysis in this table overestimates the reduction in environmental effects of Alternative IV, since many of the effects of Alternative I are INMNK or NEGLIBLE. There appear to be 8-21 inconsistencies between the resource estimates and the oil spill risk related to Alternative IV, since transportation pipelines and tankers) would account for a significant portion of the risk analysis and would occur in the Alternative IV area anyway.

Figure III-1 (preceding page II-2-1)
This map showing the sale area and the geologic basis should be modified to show the areas considered for deletion under Alternative IV. Such an overlay will be 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 in more detail terminology including "critical habitat," "important use areas," etc., which will affect the sensitivity of particular species to environmental perturbations.

Page III-1 B - 23, Final Paragraph, Line 3
Delete "and may be adversely affected by proposed OCS oil and gas activities in the lease area." The discussion is not put in terms of potential adverse effects; it is in terms of a description of the environmental effects and is inappropriate in this section because there is no discussion of the assumptions which lead to such conclusion.

Page III-1 B - 29, Second Paragraph, Lines 21-23
Delete "in terms of potential adverse effects of oil and gas activities in the lease area." The discussion is not put in terms of potential adverse effects; it is in terms of a description of the environmental effects and is inappropriate in this section because there is no discussion of the assumptions which lead to such conclusion. Inappropriately implies a conclusion without supporting argument and, therefore, is misleading to the reader.

Page III-1 B - 29, First Paragraph, Lines 4-6
The right whale sighting coordinates are not "in the lease area" (see Graphic 11). Indeed, the sighting was over a hundred miles from the lease area. The sentence should be reworded to reflect this fact.

Page III-1 C - 3
The first paragraph under "B. Salmon Fishery" concludes with the following sentence: "The North Alaskan Basin lease sale would affect both the Bristol Bay and the Alaska Peninsula salmon fisheries."

This statement is prejudicial and has no place in the description of the affected environment. Further, no information is provided to show how the lease sale would affect the salmon fisheries. We recommend that the sentence be deleted from Section III. If it is appropriate, the plan for the lease sale should be discussed in Section IV with supporting data to back up the statement.

Page III-1 D - 9, Second Complete Paragraph
No new buildings were constructed by ARCO. It would be better to 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 - 11, Section IV A.1.4, and Tables IV-1 and IV-2
It is noted that MMS has reverted to producing some optimistic development scenarios in the DEIS after significant improvement in recent Alaska OCS BIS'5. 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 area, for example, the Indioz Field in the Beaufort Sea, only 15 miles from Prudhoe Bay, was discovered in 1977 and first production is not anticipated until 1982. After a discovery, the description of the environment chapter and is inappropriate in this section because there is no discussion of the assumptions which lead to such conclusion.
only 5 years after the lease sale. The scenario also shows a
status of two years between the completion of development wells and
the actual drilling of exploration wells. 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).

Page IV - A - 2 and 3. B. Anticipated Seismic - Survey Activity

In this section the RFS refers to geophysical surveys which are
required for site clearance as 'preliminary seismic activity'.
This is a poor choice of words to describe post-sale lease site
clearance surveys which generally involve very site-specific
geophysical surveys. We recommend that such site clearance
surveys be described as 'exploratory surveys'. Otherwise, the reader
may confuse such surveys with the original seismic surveys which
are generally conducted before the lease sale.


There is some confusion in the discussion of the number of sites
for seismic survey activity. Lines 8 through 10 refer to the
number of exploratory and delineation wells and the two antici-
pated platforms, for a total of 12 expected sites, stating that
preliminary seismic activity would occur at 12 sites. The last 8-30
lines state that the number of seismic surveys may be greater
than the last two sentences seem to be more related to the next para-
graph and should be related. 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-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'.

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,
both lines. It would be reasonable to assume separate routes
through open water, but the lines would need to be routed parallel
through Hanford Bay to landfill. This would reduce the total
pipeline traverse miles somewhat. In calculating the traverse
miles, no consideration has been given to the fact that part of
the 210 km line is overland, suggested values: 20 km overland g-32
for each line; 40 km shared routing through Hanford Bay; 150 km
open water route for each line. This would give 160 km to be
surveyed, or 211 miles. At 4 miles of survey per mile of line,
there would be 445 traverse miles. In the 2nd line, the pipe-
line would be installed between the production platform and
an onshore terminal.

Page IV - A - 4. First Paragraph, Line 3

The timing for exploration drilling should agree with the timing
discussed previously (through 1990 or 1991).


All previous references to production platforms have involved one
for oil production and one for gas production. This paragraph
should be consistent.


In the second line "constructed" should be "completed". The
comment in the fourth line should be amended to reflect that
the increase in the year 1991 would be larger if there is
production from other Bering Sea areas, as discussed for
cumulative effects on page IV-A-27.

Page IV - A - 4

The Han Pedron report has indicated that the most economic trans-
port 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 Bering Sea
area, except perhaps for LNG which is considered to be a non-
upgrading material.

Also, as noted in an earlier comment, the tanker class
will probably be 125,000 DWT or greater; therefore, the loading
increments would be commensurately greater.

Page IV - A - 5. First Full Paragraph, Line 5

The time span for large traffic should correspond to the
development drilling period as discussed previously, possibly as
late as 1993.

Page IV - A - 5. A.1.e., First Paragraph

The length of pipeline mentioned should only be that which will
be underwater, or 360 km.


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.


The time frame for cuttings from development drilling should
coincide with the timing discussed earlier, possibly through 1993.
Table IV-3 shows cuttimes through 1993. The production well and discharge shown in Table IV-3 should show values for the same years as there are cuttings discharges.

Table IV-3:

<table>
<thead>
<tr>
<th>Year</th>
<th>Production Well</th>
<th>Discharge</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>1991</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>1992</td>
<td>140</td>
<td>140</td>
</tr>
<tr>
<td>1993</td>
<td>160</td>
<td>160</td>
</tr>
</tbody>
</table>

The discharge of produced waters and of sanitary wastes from one platform should coincide with the timing for the last production discussed previously (2011 or 2012). Similarly the end of gas production has previously been indicated as 2016 or 2017.

Page IV - A - 4, First Paragraph, Second Sentence

The wording would indicate that either the whole line would be truncated none of it. It is likely that a portion would be truncated but not all. Recommended: "...would occur only if..."

Page IV - A - 4, Second Paragraph, Second Sentence

Trenching volumes should be checked and corrected if necessary.

Page IV - A - 5, First Paragraph, Second Sentence

The paragraph should begin: "During the development drilling and production phases (1996-2016)." The final year may be 2017, as discussed earlier.

Page IV - A - 5, Second and Third Paragraphs, Tankers

We have commented in our review of previous Alaska OCS DEIS's on the use of worldwide tanker statistics to estimate spill-rates for U.S. OCS activities. There are approximately 1,600 tanker calls each year with a spill approach. First, since Alaska 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.

Page IV - A - 5, Second Paragraph, Second Sentence

The second problem is that the DEIS should recognize that some of the spill incidents in U.S. waters relate to foreign tankers. In the future, research over several years by Don McKay and others in Canada. It would appear that the environmental risk of oil spills is 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 2,938 barrels were spilled by U.S. flag tankers.

Page IV - A - 5, Third Paragraph

Alaska Clean Seas was organized for activities in any waters off the Alaskan coast, both state and OCS. Our justification for activities in the Bering Sea. In the second sentence, "Cost Participating Areas" should be "Cost Participating Areas."
Page IV - A - 14, Paragraph 11, Petroleum Industry Oil-spool preparedness: ACAS review

The phrase "or the adjoining St. George Basin CPA will expand include the proposed Sale H area" should be added to the fourth sentence.

Page IV - A - 17, oil spill preparedness by OCS lessees

The operational capabilities stated in this section for skimmers is not consistent with OCS requirements (July 29, 1982) contained in "Planning Guidelines for Approval of Oil Spill Contingency Plans."

Page IV - A - 20, A.4.A

The first sentence is confusing in that it refers to the section discussing only actions which will occur in the near future. However, roughly half the items discussed are leases that have been plan and leases leased. Some exploration activities have occurred on these leases, although there is no production.

Page IV - A - 22

This cumulative case analysis does not take into account the Hanford report which indicates that encroachment on offshore leading to be the most viable transport mechanism. Offshore loading would eliminate concern about the discharge below Bay facilities and/or pipeline across the Alaska Peninsula.

Page 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 Mouliffe 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 suppos = concept of alight volatility.

Page IV - B - 3, Third Paragraph

Existing bioassay results are not well related to field conditions 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 - 5, Table IV-12

This table indicates how much the percentage of the water soluble fraction of crude oil is in order to classify the concentration indicated with reference to this water soluble fraction.

Page IV - B - 34

Most of the laboratory toxicity studies referred to here are not applicable to a North Atlantic Basin spill because it would be 6 hours, not 60 hours. Even the few field studies cited (i.e. Trawl 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 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 mists, which demonstrates that actual field effects are unlikely to be lethal, should be extended to the dispersion of toxins from oil spills as discussed on the preceding pages of the EIS.

Sublethal effects of oiling 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 EIS, dispersion of discharged contamination occurs at the 10-15 meter water depth) would indeed have no harmful impact on marine organisms. This fact should be clearly stated in the EIS.

Page IV - B - 6, 4.4.1

The discussion of dispersants is accurate but does not clearly state that the on-scene coordinator of a spill clean-up can make decisions that minimize impact to benthic species by using dispersants which would only slightly increase impact to other benthic resources. For example, in conditions where birds and fish are not much at risk, dispersants may be the method of choice.

Page IV - B - 6, Effects of Habitat Types - Pelagic and Benthic

This is a good discussion which clearly states that most effects would be localized.

Page IV - B - 7

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" substrates and, as utilized by hard bottom and reef species, become artificial reefs which increases both the biomass and productivity of that given area.

The phrase "0.1 parts 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.

The offshore loading option discussed in the Han Padron report, if used, would mitigate the transport scenario effects depicted in the section.

It should be noted or explained that this spill occurred in the Persian Gulf as a result of the Iran-Iraq war.

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.

How can one sighting of a right whale (1944) be extrapolated over a twenty-year period and result in a medium to high probability of oil contacting the whale?
The use of offshore loading as discussed in the Pan Pac report would eliminate oil pipelines, and if gas were not economically viable at that time, would eliminate gas pipelines altogether.

The interference with crab pots that supply boats may encounter, as cited in this paragraph, could be mitigated through the implementation of -safe zones-. A special regulation could be established prohibiting crab pot owners and the oil industry from using crab pots that are clearly marked. Clearly marked crab pots may be avoided by supply boats. These kernels are less maneuverable vessels. Also, each platform usually would be serviced once a day by a workboat.

The statement "the oil industry is expected to develop support bases for offshore oil vessels" should be clarified, because the existing terminal (the "OGI terminal") is in place for present exploratory operations.

While Canadian oil most likely would be transported to Pacific Rim countries, it is unlikely Canadian tanker routes would traverse the sole area or Deilwash pass, but it would probably parallel the international date line.

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 OGI terminal property.

If oil is handled by offshore loading, as discussed in the Pan Pac Report, the potential impacts as cited either would not occur or be mitigated.

The phrase "varying degrees of water quality degradation" should be replaced as "varying degrees of minor and temporary water quality degradation". The resulting degradation from oil and gas exploration and production is expected to be small and transient. This terminology is used in this discussion of water quality, but should always be coupled with the first sentence to provide clarification.

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.

Table IV-3 contains values of 3.640 - 327.999 mals for total population of formation waters, not the 0.5 to 5000 mals as stated in the text. This inconsistency needs to be clarified or corrected.

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 calculations should not be used because the closest part of the lease-sole boundary is about 18 kilometers offshore (see page 11-1). This three-fold increase in distance from the shore will have a substantial impact on the onshore air quality calculations. The values in Table 11 of DEIR need to be reevaluated using an 18 kilometer boundary. Calculation of air quality effects needs to be rewritten accordingly.

Deiates "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 the geological and reservoir characteristics. Wells must be located to afford maximum geological information and reservoir production. Location of slant wells is not 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 50 to 100 feet or two or three miles, depending on the geologic structure. Drilling may not be very far before the optimum production configuration could be disrupted and the reservoir would not be effectively produced, or the resource values. Slant drilling cannot and should not be used as an emission reduction technique.

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 1974 - and that well control training has been mandatory because the rate has decreased. The EIS uses a 1974 date and says the rate has been increasing at a decreasing rate. This can be seen, by selecting different time periods the blowout rate can be calculated. This sentence is likely in line 3 after the word "drilled," it seems that a sentence be added which provides Fleury's conclusion. For example, Fleury concludes that since 1974 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 number of blowouts and of decreasing quantities of oil spilled in blowouts, with no large spills (1000 bbls or more) since 1974.

Change "kilometers" to "kilometers" per previous discussion.

The DEIS should point out that, due to existing regulation which would include stipulations 1, the oil and gas activities would be regulated on a regional basis and should be reviewed on a periodic shipper basis and so the effects would be minimal.

The reference to "monocore" platform is too specific and should be changed to "large gravity based" platforms.

How would construction and maintenance vehicles "improve the area's naturalness" when they would be confined to roads.

Construction traffic would have to be specially permitted and would involve specially designed vehicles there required. Also, there are state and federal laws against harassment of wildlife.

The number of docks expected to be used by the oil and gas industry is overstated. For the exploration phase, the Haven, St. George and North Alessio Basins, there is dock on Captain's Bay which has been constructed to serve the oil industry and 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 ratings should result in lesser degrees of impact. The OCS activity with other land uses should be moderate rather than major as identified in the EA.

Based on economics, the San Pedro 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 warranted and premature.
There is extensive discussion about impact 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 considerable speculation which would be made to avoid confusion over impacts which the activities may have on land status.

Page IV - 1 - 1, Fourth Paragraph, Line 45
Delete "ultimately resulting in reduced population levels" and insert "with population level reductions possible". It is not certain that displacement of populations will ultimately lead to reduced population levels.

Page IV - 1 - 1, Social Systems, Last Sentence
"The proposed would contribute to irreversible changes in cultural values and orientations." What this statement assumed, perhaps erroneously, is that Native cultures are fundamentally changeless unresponsive to 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.

Page IV - 2 - 1
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.

Page IV - 2 - General
Worst case analysis, or maximum effect analysis, discussions should always be preceded by a statement of the probabilities of the worst case scenarios and the probability of the full range of negative effects potentially occurring. In this way readers of EPA 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 uncertainty 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 unnecessary factual details. The key uncertainty for the worst case analysis presented in Section IV is the likelihood of a major oil spill. The likelihood that a spill will occur can only be estimated by statistical approaches, e.g. statistical spill prevention practices, well control techniques and new technologies are considered. Based on historical rate data, a site-specific correlation for spills of 100,000 barrels or greater is projected to be 0.03 spills per billion barrels of oil produced (See page IV - A - 7). This equates to an expectation of 0.03 spills of this size if all the oil projected for the North Egyptian ltags 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 necessary. 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 variety of possible scenarios. The agency would 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 of limited data and reasonable likelihood of occurrence 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 not necessarily be qualitative, rather than precisely quantitative, but will provide the decision maker with a reasonable basis for understanding the potential type 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 information which are essential to a reasoned choice or important to the decision (See 40 CFR 1502.22). The agencies are not required to
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 0
Because the expected occurrence of a spill of 100,000 bbl is only 0.95 spills expected for production of all the oil processed in the maximum case, it may be, especially with the unlikely event, the maximum case is stated 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 very likely.

Page IV - J - 2, Line 1
The maximum case is stated here to be 1.2 billion bbls. Yet at present, at least 9000 bbls, the maximum case is stated to be 0.750 billion bbls. This would give an expectation of 0.02 spills of the maximum case had it been 0.75 billion bbls. This text should be corrected to reflect this fact.

Page IV - J - 2, Assumption 1-7
It may be helpful to the decision maker to provide an estimate of the likelihood of occurrence of each assumption. Assumption 1-1 as discussed above. Assumption 1-7, which contains two portions - the likelihood of the bloom being in the northeast portion, would depend on the geographical location of the bloom 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 1-7 would have at least a medium likelihood, because there are substantial equipment and manpower resources available in Alaska and rapid access to Bering Sea equipment and manpower worldwide which could mobilize. The cleanup effort would consider any potential serious threat to the whales, as have been identified in advance through the biological resources stipulation, environmental impacts, and impacts of an accident. Assumption 1-6 refers to the specific project. Assumption 1-6 depends on the weather patterns for that portion of the Bering Sea - ice presence is reliable for the April to December time frame but the likelihood is low and to have any effect the Bering Sea for such an extended period is low likelihood. Assumption 1-6 again has two parts with gray whales and humpbacks for a time, and an uncertain likelihood provided in part in assumption 1-6 and 2 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 the whales will experience additional disturbance after a large oil spill, then the ND will limit to suspend such noise-producing operations.

Page IV - J - 3, Fourth Paragraph
This discussion should point out that the derived 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 leads 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 occurring with all the uncertainties resolved against species adaptability and reproductive powers should be included. Additionally, even if there were reversal of the currently increasing population, would that reversal be a temporary plateau, a 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.

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 7
Since right whales have not been sighted in the whale area (see Graphic 6 and pages 22-1; 22-2 and 29), the probability that they would be feeding in the whale area would be low.

Graphic 1
It would be helpful to include latitude and longitude marks.

Appendix A-1
With reference to delineation wells, it should be noted that the drilling of hydrocarbons accumulations and the strategic location of platforms in order to produce the oil efficiently, usually require an area of fire delineation wells. The schedule of fire avoidance and detection. Assumption 6, estimated likelihoods are provided in part in assumption 6 and 2 on page IV - J - 1, but should be clarified here. Assumption 6, has a very
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 San Pedro report.

8-109
8-110
Appendix, Table 8-1
Appendix C

The assumptions and data on this are all in Appendix 8-1.
The table shows the calculations used to estimate the potential for aquatic impacts of the proposed offshore terminal. The data points are not applicable to this area.

1065

1064

Appendix C

Although the potential offshore pipeline route from Herendeen Bay to Delboe 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 ESAs have addressed those values.

Response 8-3

Response 8-4

The development of an offshore pipeline route is based on several assumptions: (1) the pipe would be placed in a 200- to 300-foot-deep

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 ESAs was believed to be commensurate with the resource level of the 8-110.

The 8-110 is the preferred for the expeditions and economical use of terminal facilities. The 80,000-100,000 barrel used in the analysis would visit the terminal every 5 to 7 days during peak production. During the decline of production, vessel visits would vary significantly within 10-day turnaround time.

Although the potential offshore pipeline route from Herendeen Bay to Delboe 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 ESAs have 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 8-1, 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.

Table II-1 shows revised resource estimates for Alternative IV.

The development and transportation scenario selected for analysis for Alternative I in the ESAs include (1) a pipeline to the 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 ESAs, the selected scenarios do not represent an OCS recommendation, preference, or endorsement of facility sites or development schemes. The ESAs 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, 1976), the Bristol Bay Regional Management Plan (1985), and the Draft Alaska Peninsula National Wildlife Refuge Comprehensive Conservation Plan (ORDIS, U.S. FWS, 1986). 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 NOAA'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 the 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 environ- mentally preferable." The last sentence of this paragraph states, "In selecting the means of transportation [of hydrocarbon], consideration will be given to recommendations of the Regional Technical Advisory 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. In the "cumulative" situation in which pipes to exist, the NMFS will take every effort to prevent adverse effects on endangered species from occurring. The Table 40 (California) NMFS biological opinion stated that, although they did not find evidence to gray whales passing through the area, "Environmental conditions in Alaska . . ." Since the 1988's has determined that conditions do not apply to conditions off Alaska, the NMFS has proposed several mitigating measures to protect

depend牙ed 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 discursions and the other applies to oil spills.

Response 8-9

The information to Leasers (TLS) 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 8-9.

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. Where oil-slip trajectories occur only during the seasons in which salmon are present.

The NMFS agrees that most oil-slip risk to Resource Area 1 is caused by the assumed transportation scenario, which pipes all oil from the proposed sale area through the resource area. Most of the oil risk is 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-slip occurs. Factors that limit the effects on fisheries are discussed in the site-specific analysis in Section IV.B.3.a.(1)

All NMFS OCS oil and gas lease sale USF's are based on the unfished resource estimates and do not incorporate the likelihood that commercial quantities of oil-slip not be found.
Response 8-14

Based on the definitions assumed for the effects assessment (Table 5-1), 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 8-16

The analysis of the local economy focuses on Cold Bay and Unalaka, 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.(1) of the FEIS).

Response 8-17

This concern is addressed in Response 8-2.

Response 8-19

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 NPS 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 FEIS that certain pinniped species and sea otters "... may be adversely affected by proposed offshore oil and gas activities ..." explains why these species must be discussed in the EIS (versus discussing uncommon or rarely occurred 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 8-20

The text has been amended to address this concern (Sec. IV.B.1.e.(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.C.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 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 (1987).

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.B.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 Nan Padrón 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 impacts of a crude-oil-loading-transportation system. If industry were to employ an oil-transportation system involving tanker 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 large traffic corresponds to the development-drilling period identified in Tables IV-1 and IV-2-between 1990 and 1999.

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. of 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 FEIS). Table IV-3 of the FEIS has been amended to address this concern.

Response 8-36
Table IV-1 has been amended to address this concern.

Response 8-37
The text has been amended to address this concern (see Sec. IV.A.1.6. 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 tankerings 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 commenter 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 Alaska law that forbids dumping of oily ballast water within 50 miles of Alaska’s coastline. According to the Associated Press (1983) 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, “... 6 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 plunged 10,000 No. 1 and No. 2 cargo tanks (Von Chong et al., 1983). The ship did not stop, but continued on, spilling 4,200 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 0.63 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 commenter states that only 2,986 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 Taconic 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 operation, 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 southeastward through and past the Haverin 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 commenter is correct. The MMS will require skimmers in the North Aleutian Basin to be capable of operating in 8- to 10-foot seas and 25-foot 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.a. of the FEIS.

Response 8-49

The text (Sec IV.A.4.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.
If an oil-transportation system involving tanker loading at offshore terminals and routing of loaded tankers directly to markets were employed, the MMS agreed that the concerns relating to an oil pipeline across the Alaska Peninsula and a terminal at Sable Bay would be eliminated. Based on the analyses presented in Section V.A.6.b. of the FEIS, the potential effects of such operations are considered to be minor.  

Response 8-50

Because aromatic compounds in crude oil spilled in the southeastern Bering Sea have been shown to be very toxic to fish in the EIS (Hamm, 1982), the potential effects of such exposures must be considered in the analysis.

Response 8-51

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 exposure in the bioassay. It also is stated in the FEIS 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 (Hamm, 1982); exposures following an oil spill in the North Aleutian Basin could exceed this time period."

Response 8-52

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) that have some level of effect (i.e., sublethal or lethal), generally below 1 ppm, total mortality. The percentage of the water-soluble fraction of crude oil is not necessary for this comparison.

Response 8-53

The discussion of laboratory toxicity studies in Section V.B.1.a.1(3) 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 8-54

Exposure time from the cited studies has been included in the FEIS.

Response 8-55

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 to the water column is in Section IV.A.3.d.

Response 8-56

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 8-57

This concern is addressed in Response 8-66.

Response 8-58

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 8-59

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(3) of the FEIS. Further, the fact that NPDES permits are required does not necessarily preclude the effects from occurring. Therefore, a discussion of potential effects from discharges is warranted.

Response 8-60

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 8-61
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 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 Pribilof 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.

The conclusion of effects on groundfish has been clarified (see Sec. IV.B.1.a.(1)) of the FEIS.

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.

A discussion of factors that would limit the risk to king crab has been included in the FEIS (Sec. IV.B.1.a.(1)).

The phrase "0.1 per million" refers to the water-soluble fraction; this distinction has been included in the FEIS.
were to employ an oil-transportation system involving tanker loading at offshore terminals and routing of loaded tankers directly to markets, the NOG 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 8-72

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 fishing 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 supportive 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 Responses 8-43. The reference to Canadian production being handled through the lease sale area and the Dismal 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

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 text has been amended to address this concern (see Sec. IV.F.1.a. of the FEIS).

Response 8-86

The "small area" referred to is essentially a point source for all protected emissions. In reality, 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 8-88

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 some of several options available to producers to meet air-quality standards.
Response 8-87

The reference to Fleurry (1983) has been added to the FEIS bibliography. However, the Fleurry paper contains no statistical analysis to support its conclusions. Fleurry suggests that the rate of drilling blowouts decreased since 1978 because of stronger federal training requirements. This statement may or may not be correct. Fleurry's data calculate to a 1979-1982 average of 2.61 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 Fleurry, 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 OGS 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.A. 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 success in mitigating wildlife 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 Padrón 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 FEIS 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.1., and could create major effects in the Fort Holler/Sablos Bay transect by the Alaska Range and at Sablos Bay.

Response 8-94

The facts 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 (CHROME)." 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.a.(2) of the FEIS.

Response 8-96

As discussed in Section IV.B.1.e.(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 8-98.
Response 8-98
This concern is addressed in Response 8-99.
Response 8-100
The text has been amended to address this concern (see Sec. IV.1.2. of the FEIS).

The acknowledgment that social and cultural changes (including material culture) could emerge from the proposal recognizes the inevitable complex processes that characterize industrial development in a rural, subsistence-based environment. Thus, as stated in Section IV.1.1, "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 NEPA 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 trend in activities. Therefore, the probability of a large spill (assumption No. 10 in Sec. IV.1.2) does not specify 100,000 bbls) could range from medium to low during the gray whales' high-use period.

As requested, the text has been amended to clarify that Scenario 3 is not a sequence, but rather describes the scenario used in the worst-case analysis (Sec. IV.1.4.6) of the FEIS. The estimate of likelihood of the worst case occurring is stated in the conclusion.
Response 8-103
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.
Response 8-104
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 San Pedro Report ("Evaluation of Bering Sea Crude Oil Transportation System"), 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-1G through G-15G) include information as to whether the tables apply to the proposal, the Alaska Peninsula deferral alternative, or the cumulative cases with proposal. The conditional probabilities of Tables G.1 through G.5 are not dependent upon or referenced back to the proposal, the alternative, or the cumulative-case scenarios.
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 Alaskan Basin OCS Lease Sale No. 92 Draft Environmental Impact Statement (DEIS)

Dear Mr. Powers,

Bohio Alaska Petroleum Company is pleased to submit these comments on the North Alaskan Basin OCS Lease Sale No. 92 DEIS. In addition to our comments, Bohio 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 are, for the most part, unequivocally support Bohio's belief that oil and gas exploration and development in the North Alaskan Basin poses only a minimal risk to the environment, including the world-class fisheries resources. The effects of the proposal (Alternative I) on fisheries 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 none.

Bohio, thus, strongly recommends proceeding with the sale as scheduled with the proposed action (Alternative I). 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. 

Alternative II, Delay of the sale for five years (Alternative III) or deletion of all tracts within 25 miles of the coastline (Alternative IV), Bohio believes that the North Alaskan Basin has significant oil and gas potential. In 1984 this area was rated second in interest of all 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 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 Bohio's estimate of the area's potential. In addition, Alternative IV (deletion of tracts prospectively across the entire sale area) would remove a significant portion of the sale-wide area and the area proposed for deletion under Alternative IV.

Bohio, which has conducted its own review of the environmental data base in the Bering Sea, believes that additional 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 (907-346-7500).

Yours sincerely,

Bruce T. Clancy  
Exploration Operations Supervisor  
PB/HI/25770

(ILLUMINAT; 14. 3. 31929, 1985; DURING XE TTTTLY. AN EVALUATION OF THE ENVIRONMENTAL STATEMENT TO DETERMINE OIL AND GAS EXPLORATION AND DEVELOPMENT FOR THE ALASKA OCS AREA OFFSHORE ANCHORAGE, ALASKA, AND ALASKA PETROLEUM COMPANY, ANCHORAGE ALASKA, IV 180 PP.)
1. DEVELOPMENT SCENARIOS

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 frame indicates 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 after 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.

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 OKEIS; this is a highly feasible economic and engineering option that should be examined 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 FPSO by Han Fadon) could obviate the need for extensive pipeline construction and the construction of a terminal on the Alaska Peninsula. The OKEIS should therefore evaluate the potential spill risks and environmental effects of this development alternative.
The alternative 1 scenario portrays a most circuitous offshore pipeline route through Port Moller and Serendip Bay rather than a direct linefall which would probably be technically, economically, and environmentally more feasible.

2. OIL SPILL RISKS ANALYSIS

Much of the increase in the overall quality of writing presented in the Oil Spill Risk Analysis, Section IV.A.3, is due to our concern about another previous DEIS risk analysis. Our responsible position still exists. There is no presentation of the Alaskan oil spill industry's excellent spill response and cleanup record. Industry has a very good record of large spills during drilling operations (as defined by text on > 1000 barrels 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 Spill Mitigation 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 American Arctic lease sale area. Much concern with the conclusion that effects on the fishery resources would be negligible or minimal.

With the potential effects on the fishing industry, which the DEIS projects to be generally minimal, we believe that the analysis could have been broader and more balanced. Through a review of all 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 minimal.

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 on-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. principal the Gulf of Mexico, California, and Cook Inlet. Indeed the fishery 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 reparation 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

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 MMPA and CERG 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 CERG regulations. It so distorts a worst-case consideration that a reasonable perception is not possible. We encourage MMP to base worst-case analysis on scenarios that are realistic.

DETAILED CONCERNS

Page 10-3-4. Stimulation No. 5. Transportation of Hydrocarbons

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 impacts and risks. This is not the case when the record is reviewed.

Page 10-5-11. Information on Potential Gear Conflict with Commercial Fishing Industry

Through the examples of the oil/fisheries group, there is an ongoing 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-4-1. Section IV.A.1

See our General Comment No. 1.

Page IV.A.2. Anticipated Seismic Activity

This section should more clearly differentiate regional seismic survey activities conducted before the sale and site specific geohazard surveys conducted on specific drill sites or geologic structures after the lease sale.
The DEQ 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.

The statement that "the pipeline split 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 Timlick et al. entitled "Patterns and Trends in Bay-tell 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).

The use of worldwide 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.

The reasons given for the observed drop in spill statistics for tanker spills were stated to be only speculative but not statistically proven. Both papers, Leafer and Moore (1983) and Yoshida (1983) state these same reasons for trend =inaction. Reasons why this information cannot be statistically proven should be given.

With respect to the statement that "... the only possible comparison of OCR statistics with Alaskan data are for the state-leased offshore Cook Inlet and Prudhoe Bay/Kuparuk fields," the DEQ should note that the Prudhoe Bay/Kuparuk fields are not situated on offshore lease tracts.

The Alaskan Record

NRHS is to be commended for inclusion of this section in the DEQ's. The oil industry has been operating offshore in Alaska for more than 30 years (specifically in the Cook Inlet) and the operating record for this area should be addressed along with the OCR statistics. However, the dilemma in including this information in the DEQ is the creation of additional statistics to verify and question. The following comments are directed toward the information in this section.

NRHS does not agree with the hypothesis that spills from commercial activities located adjacent to an oil production field should be included in the spill analysis for that field. Spill rate predictions are based on two assumptions: (1) future spill frequencies based on past OCR 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 the above assumptions. In addition, spills which are not directly controllable by the field should not be considered statistically associated. Using the Paramarum 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 Paramarum would not be representative since control over the tanker is no longer with Alyeska operations. The use of the Paramarum 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.
This table may not present an accurate picture of Alaskan spill history.

(a) More complete referencing of statistical sources is needed to allow for verification of data by the reader. The range of data in which the spills were observed would also be helpful. ARDC has reported spill records on a listing system for years 1979 to present. They encourage the use of this system by NRDC when compiling tables such as this one to ensure data accuracy. This would work both ways. In the case of a NRDC known spill that has not been reported in ARDC 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/Tupparut resulted from leakage of underground fuel tanks belonging to a commercial carrier line. This incident has no connection with airfield operations and could occur from any airfield in the U.S. There is no ARDC record for the other noted airfield spill. See comment (a).

(d) Tanker spills: Based on ARDC spill report records and discussions with 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.
has disregarded other viable techniques such as the use of dispersants and insti-burning. Natural dispersion, dissolution and evaporation of oil would be optimum in extreme sea state noted. Shoreline protection operations can also be accomplished without mobilizing to sea. These concepts, along with the successful use of dispersants in high seas states, were recently observed during the Peninsula Ekran 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 conditions are protected by an ice cover and snow cover.

In addition, this discussion overlooks a regulatory safeguard set up to ensure industry response capabilities. One Order No. 7 requires that a lessee have the capability to respond and clean up spills under reasonable conditions or permits to drill will not be issued.

Frazier et al. (1976) reported that beluga moved away from a large oil leak. The range at which the reaction was seen was about 200m (approximately 1.5 miles), and the situation was relatively confined (i.e., shallow water), a circumstance in which a greater response would be expected.

Reclamation signals are of high frequency (2-10kHz), well above the frequency range produced by industry operations. Therefore, reclamation 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 Baja N. 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.

The 10-20 percent mortality figure mentioned seems high. It is not clear how this figure was derived.

The 180km 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, sounds travel much less efficiently than calculations would indicate, and the 180km figure probably exaggerates the situation to a large degree. Although not stated, the sound involved in the theoretical calculation presumably was an acoustic 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.

It should be pointed out that the statements made by Oserti and St. Aubin (1979) were made in the absence of information about the affects of oil. Their subsequent research (Oserti and St. Aubin 1982) alluded many of the earlier concerns.

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.

It should be mentioned that "huddling" was reported by Reeves and Ljungmark 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.)
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 assure that conflicts are avoided, the Oil/Fisheries Group of Alaska initiated a voluntary program in 1982 which is described in "A Manual of Deepsea Operations in Fishing Areas of Alaska." If and when development activities occur in the Beaufort Sea, the Oil/Fisheries Group will be available to provide the necessary communications to avoid or mitigate potential oil industry-fishing industry conflicts.

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 on unrealistic development assumptions (i.e., a circumvent marine pipeline route through the entire length of Port Moller and Veredden Bay). The probability of a major spill at the location and time hypothesized 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.

The designation of preferred transportation corridors on the basis of reconnaissance level data evaluation does not provide the necessary flexibility to assure the near satellinity, communality, and environmentally preferable pipeline route. In the BEIS, that an overland pipeline/oilshore terminal is deemed the most feasible development option is purely speculative, therefore, to project a MAJOR effect on wildlife values at this time.

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 view of this DEIS that incorporates its use as a development scenario. The very purpose of these planning efforts is to assure that failure "...to conform with social and economic facility siting policies..." does not occur.

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 by the Alaska Coastal Policy Council and NOAA, should include provision for energy facilities which are "Use of State Concern." This statement should be deleted in its entirety.
by the International Whaling Commission) by the Soviet 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 IWC assume that some unidentified cetaceans, in addition to the oil spill, take the gray whale to some small percentage of its current numbers?

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 gunners and men.

No doubt oil will kill gray whale gray whales, but it would be impossible to seriously deplete gray whale food resources with a large-scale oil spill in the Bering Sea area. This is particularly true since the main feeding ground lies several hundred miles to the north in the northern Bering and southern Chukchi areas; only a very small number of gray whales remain in the southern Bering during summer.

With respect to potential noise disturbance, it should be remembered that there are hundreds of fishing vessels now plying the waters in the Bering 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.

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 affects on skin cells. Further, the notion that the major feeding area hundreds of miles removed from the Bering 92 area could be affected and that the reproduction of the population could so adversely change as to result in complete reproductive failure is preposterous.
Response 9-1
This concern is addressed in Responses 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 or the offshore-loading facility is set and affixed to the seabed.

Response 9-2
Based on the report ("Evaluation of Bering Sea Crude Oil Transportation Systems") by Pan Fadron 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 9-5.

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 occur.

The Information to Leases (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 "safe" and site-specific geohazard surveys conducted at drill sites.

Response 9-10
The potential pipeline route outlined in Figure IV-2 was identified in the Bristol Bay Area Plan for State Lands (State of Alaska, 1984), the Bristol Bay Regional Management Plan (BRRMP, 1985), and the Draft Alaska National Wildlife Refuge Comprehensive Conservation Plan (ANCHOR, PMG, 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 are 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
Tomilaka et al. (1985) define large spills as those over 100 gallons (238 barrels). The MMS considers large spills to be those of at least 1,000 barrels. Therefore, the MMS does not agree with Solih's claim of 238 barrels is a large spill.

Response 9-12
This concern is addressed in Response 9-39.

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 Tomilaka et al. (1985). Lanehart and Amundt (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 tanker occurred," Landier and Amsbary, when associated with the OCS program, reviewed (and agreed to) a DMLH study that consistently indicated that any such influences to cause and effect were not removed from the text.

The usual assumption made when a presumed relationship cannot be statistically demonstrated is that such a relationship exists. The text (Sec. IV.A.3. of the FEIS) has been amended to include the suggested information.

Response 9-14

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, ARCO, and the State of Alaska Oil and Gas Conservation Commission attended (also see Response 8-60).

The tanker spill referenced by the commenter was of Prudhoe Bay crude and was spilled by a U.S.-flag tanker carrying Prudhoe Bay crude to market (also see Response 8-18). The commenter'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 commenter does not agree with the concept of "...inside to prove 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 9-15

The spills listed in Table IV-7 were compiled by the Alaska OCS Region from several sources. Documentation was obtained from Blair Woodwell (State of Alaska Oil and Gas Commission) for 2 pre-1976 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. The 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/Nupsaruk complex was provided by Yon Chung 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/Nupsaruk 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 commenter 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 BLM 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/Nupsaruk complex is discussed in Response 9-46. Alaska tanker-spill statistics are discussed in Response 9-18. The commenter 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 commenter'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 9-15.

Response 9-19

The text (Sec. IV.A.4. of the FEIS) has been amended to include this information.

Response 9-20

This concern is addressed in Response 1-12.
Section IV.B.1.a.(3) of the FEIS has been amended to reflect this concern. However, in response to the concern 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.

The estimated 10- to 20-percent reduction in harbor seal pup numbers due to aircraft disturbance may be very 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).

The following excerpts from Gales (1982) are applicable:

"... that ranges of audibility by marine animals of sounds at all 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 15 miles, even for a platform. Calculations of detectability of platform noise using the source-path-receiver model indicate that many cetacean 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 estimate of the range of 185 kilometers for possible detection of platform noise.

The text (Sec. IV.B.1.a.(4) of the FEIS) has been clarified to reflect this concern.

As stated in Prater (1984, p. 47) "Hawes et al. did record an unusual behavior, which they termed 'huddling,' in the presence of seismic sounds." Further review of Hawes et al. (1983) gives details regarding the frequency of seismic sounds recorded at the whales' location when the "huddling" occurred.

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.

This analysis is not based on a "circumvent marine pipeline route through the entire length of Port Noller and Beralno 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.

The Port Noller/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, 1986), the Bristol Bay Regional Management Plan (EBRO, 1985), and the Draft Alaska Peninsula National Wildlife Refuge Comprehensive Conservation Plan (USDI, FWS, 1986). 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 NPS's intention to identify 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 Noller/ 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.B.4.6.).

Response 9-29

The text (Sec. IV.E.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 corridor 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 analyses conducted are based on these state policies. District policies, when approved, will supplement those of the state or, in some instances, replace them (see HECO, 1982; 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 HNS Regional Supervisor, Field Operations (REFO), has indicated that, if necessary, shutdown procedures would be decided on a case-by-case basis. The REFO 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 Holzer/Nelson Lagoon area, not the entire Sale 92 area as indicated by the commenter. In laboratory and field experiments, amphipods avoided recolonizing oil-contaminated areas. The LC50 for Dragon amphipods 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 (degradation 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 oil 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 anaerobic 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 Alutian Shelf Synthesis Report (Thorsteinsson, 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 Alutian 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 herring fishing is conducted 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

The worst-case analysis states that a 100-day oil spill would deplete the prey in the Port Holzer/Nelson Lagoon area, not the entire Sale 92 area as indicated by the commenter. In laboratory and field experiments, amphipods avoided recolonizing oil-contaminated areas. The LC50 for Dragon amphipods 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 (degradation 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 oil arctic sediments persist in a
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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 indicated that the amount of oil in
the sediment after a spill can range from 1 to 100 percent.

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 predictability is
just a matter of quantitatively describing all variables. Con-
sequently, 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 Environ-
mental 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 conse-
quences must be considered by an agency.
March 13, 1985

Mr. A. I. Powers
Regional Manager
Mineral Management Service
P.O. Box 10138
Anchorage, AK 99510

Dear Mr. Powers,

We have reviewed the above referenced document and set the following commentary for your review and consideration.

We recommend proceeding, as scheduled, with the proposed sales. Alternative II to direct all leases to Cook Inlet is not practical. We also recommend that, due to the remoteness and harsh environment of the area, the leases 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; these being, cancellation of Alternative II and delay (Alternative III or defer) 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.

Further, we feel the EIS should not appear to favor a particular design or system alternative. Technical, economical and environmental considerations should prevail when it comes to deciding systems such as those discussed in the EIS. The EIS seems to indicate, and emphasize, that the crude oil ashore and land transports 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.

Finally, by using conditional and final probabilities in oil spill risk analysis, the reader is led to believe the high projections for oil spill impact will happen within given target areas.

Yours very truly,

D. W. Granell
Acting Executive Vice President
IBD/DE
3/11/85
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 NOS 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 hosts are made by EIS analysts, not by the oil-spill-risk analysis in Section IV.A.1.

Regional Director, Alaska Region
Minerals Management Service
P. O. Box 101159
Anchorage, AK 99510-1159

Re: Comments on DEIS for OCS Sale #12
North Aleutian Basin, Alaska

Gentlemen:

Marathon Oil Company appreciates the opportunity to submit comments on the DEIS for OCS Sale #12, 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 – Proposed, 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 in harmony 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.
February 27, 1985

U.S. Dept. of the Interior
Minerals Management Service
ATN Alaska Regional Director
P. O. Box 101159
Anchorage, AK 99510

Greetings:

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT NORTH ALCATAN BASIN SALE NO. 92
ALASKA OCS REGION

We have reviewed the Draft Environmental Impact Statement (DEIS) for North Alcatan 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 contract deletions. Otherwise, there will be a serious negative impact on the timely resource evaluation of a large area with major hydrocarbon potential.

The North Alcatan Basin Planning Area consists of 35.5 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 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 II are indicated in the DEIS to be negligible or minor, except for moderate affects to sea otters and marine birds. Furthermore, any impact to transportation systems and coastal land use plans. Shell Western feels this environment is similar to the impact considered in previously issued Shell Western DEIS's. 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 counterproductive 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 extends to 15 miles the near shore buffer zone, would result in the further deletion of approximately 711,000 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 this action. The total reduction in sale acreage as proposed in Alternative IV could result in a significant reduction in the area's resource potential.

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 1983 Department of the Interior analysis of industry ranking of OCS areas. The analysis ranked the North Alcatan Basin second in interest and third in resource potential for all offshore Alaska.

The potential benefits of hydrogen 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 DEIS Sale No. 92 as presently scheduled.

Very truly yours,

P. O. Council
K. T. Howard
Geologist
Rocky Mountain and Pacific Frontier Divisions.
Response 12-1

The Draft Proposed 5-Year OCS Oil and Gas Leasing Program (March 1985) shows the industry ranking of the North Alaskan Basin to be third in interest and fourth in resource potential among the Alaska OCS leasing areas. The NGO ranks the North Alaskan Basin fifth in unrisked resources for Alaska. Considering the uncertainties, this probably is not a significant difference.
March 7, 1985

Mr. Glen Tankus
Regional Supervisor, Leasing & Environment
Mineral Management Service
850 M Street
Anchorage, AK 99508

Dear Mr. Tankus:

The Nelson Lagoon Village Council unanimously supports Governor Sheffield's nine year moratorium regarding the North Aleutian Basin Sale #2. We believe more research is needed in the DEIS. We would like to add that we strongly support the Aleutian Set CREA Board Resolution concerning this sale.

Sincerely,

Paul M. Gundersen
President

March 29, 1985

Mr. Richard Miller
MAMS 15441 USDOE
12100 States Valley Road
Reston, Virginia 22091

Dear Mr. Miller,

This is in reference to your draft environmental impact statement on OCS Lease Sale #2 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,

Joyce M. Ward
Chief, Ecology and Conservation Division

Enclosure
DCig
The National Oceanic and Atmospheric Administration (NOAA) reviews the draft environmental impact statement (DEIS) for Lease Sale No. 62 in the North Atlantic Basin. Although the major environmental issues surrounding the proposed action in Bristol Bay, Alaska have been described, several sections are quite well-written and informative. The review has identified several sections in the document that require clarification.

Organization/State
The document is difficult to review because of its complexity, organization, and layout in which the impact analyses are conducted. For example, the document is written in such a way that it is difficult to follow one theme or argument from beginning to end. The document also suffers from various different figures and maps.

Summary documents were often used which resulted in a gluing together of various related themes from many different sources. While information is not always available, the information given is often incomplete and not clearly related to the overall objectives of the study. The document is difficult to follow for the reader to get an understanding of the site relative impacts on many ecologically important species.

14-2

14-1

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probabilities appear to be too consistent and current-driven, whereas most of the lease areas respond to wind-driven forces. The transition seasons (spring and fall) appear to be obscured by the choice of only two seasons for the specific. Ecological information regarding the North Atlantic Basin is available and should be consulted and integrated.

Finally, serious, thoughtful, consideration and discussion of clean-up probability oil spill effects, costs, mechanisms and results - both as "efficiency of clean-ups" and "positive environmental impacts" should be fully documented in the DEIS.

Drilling and Recent Research Activities

Drilling

The MMS has failed to incorporate a significant amount of pertinent information in the DEIS (See Attachments). This is unfortunate because many studies were purposely designed to: a) describe populations at risk, especially bald, cormorants, 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 British Bay that are providing physical and biological data that are important to the analysis 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 spills on herring. This two year study is expected to be completed in FY 98. Two other studies, avian behavior in submersibles and subsurface production, should be mentioned. These 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 consequence of the proposal, and that a MMS effect in a local area or in a local stock should be treated as a more regional, or even global, effect rather than a generation effect. Another reason effects are minimized is that this section portrays the worst case scenario, rather than the other case as represented by the maximum resource scenario. Under the maximum case many of the MMS impacts become moderate or minor. We believe that the worst case scenario deserves better analysis and visibility in the DEIS.

An example of this approach is found in the description of risks of oil spills to the Fort Moller area. This is an area where potential habitat disruptions from the proposed actions seen likely and environmental risks are negligible. The DEIS notes that there is a 50% chance of an oil spill greater than 1000 barrels occurring in the area over a 20 year period, and that the DEIS notes that there is a 50% chance of a change in contact with other regional spills. Here, the worst case scenario presented in the DEIS is the "30%" or "minor" effect linked with the probability of a spill, but the recognition that this is a significant fishery is not addressed. MMS should evaluate what would happen if all spills were actually introduced into the Fort Moller area. Several local and regional fishery issues may be important.

The proposed action is a draft MMS Regional Study Program for FY 92. The MMS has failed to incorporate a significant amount of pertinent information in the DEIS (See Attachments). This is unfortunate because many studies were purposely designed to: a) describe populations at risk, especially bald, cormorants, 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.

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In the next five years much new information will be obtained regarding the ecological and economic impacts of oil spills. This information will be necessary to develop a long-term strategy for minimizing the effects of oil spills on the marine environment.

4. Special Hazards.

The DEQ does not provide a comprehensive analysis of possible environmental consequences of the proposed action on sensitive habitats and the populations they support. The value of these habitats to various fish and marine populations should not be underestimated because of their potential for continued oil and gas development.

5. Summary/Recommendation.

Substantial information needs to be gathered preparatory to designing and implementing plans to minimize the impacts of oil spills. The studies will be designed to assess the potential impacts of oil spills on the coastal and oceanic ecosystems and to develop strategies for reducing these impacts. The studies will be carried out in cooperation with other agencies and organizations concerned with oil spills.
for OCS-related studies in Alaska will extend the time necessary to complete these studies in the North Pacific 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 these resources requires revisions. These revisions need to be done prior to the OCS regulations analysis so that the document will address the issues appropriately.

14-17a

Our detailed comments follow. We ask that MMS incorporate our comments in the EIS 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.

14-17b

SECTION BY SECTION COMMENTS

SUMMARY (pp. xvi-xvii)

The summary should be revised. Here should be given the summary statements that are found throughout Section IV. Why should Alternative II be rejected? Why should Alternative I not be rejected? Why should Alternative I be rejected? Why should Alternative III be rejected?

14-18a

Table 5-1: The use of footnotes, i.e., 5-1 is misleading. It obscures the fact that MODLAB (and MAROP for King Crab) impact is likely "If an oil spill occurs and contacted nearshore areas..."

14-18b

SECTION I. PURPOSE FOR ACTION (pp. 1-4 to 1-6-1)

We find the page numbering system extremely cumbersome for providing comments. We recommend that MMS eliminate the subsection letter/numbering system (e.g., I-A). We also believe that pages with figures and tables should be numbered to ease the reviewers comments effort.

14-19a

PP. 1-0-1: The second specific concern listed in this table does not indicate what section of the DEIS to refer to.

14-19b

P. 1-0-6: We believe the DEIS should assess the effectiveness of oilspill response and cleanup, as it certainly does make assumptions regarding those when it addresses oilspill effects in later sections.

14-20a

SECTION II. ALTERNATIVES INCLUDING THE PROPOSED ACTION (pp. 11-9 to 11-9-1)

Here we find that the action alternatives, although seemingly four, are in reality only two. Alternatives I and II have the same resource estimate; Alternatives II and III both are only temporary (up to five years) delays. We believe that MMS should offer an alternative that reduces the size of the offering, the level of activity and resource estimate, and provide toward environmental risks as a part of the EIS analysis.

The EIS identifies "potential" mitigating measures but says that they are part of the proposed action. Can this be assumed? The EIS should identify other measures that are not part of the proposal, but which could be taken that would further reduce the environmental consequences of the action. EIS should recommend that MMS conduct a commercial and physical seismic surveys in 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 enhance some unresolved concerns that are inherent in the proposal.

P. II. C.6. One offshore platform seems very low for the production of the main 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 extract the oil.

P. II. C.7. Certainly Unink Pass should also be considered as an "Area of Special Biological Sensitivity." 

P. II. C.8. The statements that the IIN on Bird and Mammal Protection has "only a minor overall benefit" to local cetacean populations should be reexamined, if there is little to the contrary, then perhaps something more stringent should be designed to protect endangered whales and other marine mammals, or the conclusions about the overall benefit of the proposal should more clearly reflect the lack of protection afforded by this proposal mitigating measure.

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" and it such an analysis were included, the only data given would be Table II-2, without the projected resource estimates and scenarios being different between the two.

Table II.1: No mention is made this time of the impact "if an oil spill occurred and contacted nearby areas...". This seems to ignore the possibility of future spills. Further it is not stressed that Alternative B does not reduce the conditional resource estimate at all. A final note, specific wells do not breed on Anak Island.

Section III. DESCRIPTION OF THE AFFECTED ENVIRONMENT (pp. III. A.2 to III. D.17)

We believe this section provides over-simplified information on the geology and morphology of the lease area by not considering the variability in wind patterns, local currents, and seasonal ice cover, and temperature for the southern Bering Sea region, overestimating usefulness for lease area prediction.

The subsections on fishery resources, marine mammals, and commercial fisheries are relatively accurate but general. Site specific information is necessary and limited in predicting environmental consequences in areas lacking and inadequately described. 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 approximated or described with any reasonable certainty. This wastes the considerable assessment of impacts. The resource and habitat descriptions are generally lacking in attention to the backside of the Peninsula (i.e., Ballyhoo Bay and the proposed tanker route) where some of the potential habitats can be anticipated. Little attention is given to ecosystem and habitat linkages that could affect specific resources, food web interactions, or ecosystem processes that underlie the productivity and resource values of the region. Critical habitats are inconsistently identified for the various resources.

P. III. A.2: Earthquake hazards certainly deserve more detailed discussion than that given here, especially because of the Thumrait Gap Hypothesis and its implications for both oil spill risk and human safety.

P. III. A.4: No mention is made of the fact that the caps across the Alaska Peninsula, e.g., Gold Bay and Port Moller, greatly perform large scale wing. Schumacher and Noon (see Schumacher, J.D. and P.D. Noon, 1985. Circulation and hydrography of Prince and Discovery Bays, Alaska Peninsula, MPA Tech. Rep. 936. 76 pp.) clearly note this effect in particular in the critical local effects have been accounted for in oil-trajectory analysis?

P. III. A.5: Last line: The inner front is 15 km wide, not 50 km.

P. III. A.5: 1st line: Schumacher et. al. (See Schumacher, J.D., T.H. Kindig and L.W. Crowe, 1985. Eastern Bering Sea, Regions of Dephth and Data Bank. 31, 189-195.) note that vertically mixed conditions do not exist in the Regions of Direct Influence of freshwater discharge (low GPU -< 0.4) and that the water in the cold frontal areas can be critical e.g., the cool (Cu-FhM) and Schumacher and Noon (1985) clearly show identification of the vicinity of Port Moller.


P. III. A.5: 3rd para: Schumacher and Kinder (1983) state that winter flow along the Peninsula is substantially greater.

P. III. A.5: 3rd para: Again Schumacher and Kinder (1983) have used more extensive data sets. The new values for total energy in the inner and middle shelf regions are 34 and 92 respectively. Where that 420 to 45S is a draft report for the outer shelf domain, not for the coral reef system and the following years, where the climate change for total energy 1985) was a DRAFT report for the outer shelf domain, not for the coral reef system.

P. III. A.5: 6th para: Both Overland and Paces (1981) and Webster (1981) agree that upper air (700mb) streamer of storms regulates ice extent. Of course, as Webster notes, SIT follows the year-to-year variation in storm tracks. There are not two hypotheses.

P. III. B.4: 7th para: This sentence is not true and is not found in Overland and Paces (1981). The ice limit is a balance between ice (suction at the ice edge) and melt, not ice content in the upper ocean.

P. III. A.6: 1st para: What is the reference for ice 2 to 4 m thick?
There is an incompatibility here between the statements on the abundance of echinoderms or king crabs in the benthic environment that would be corrected.

Chitinesterase is consistently assayed throughout the document.

Dungeness crab appear only to be found nearshore in the more rocky subtidal habitat present north of Anvil Island.

This information on marine and coastal birds doesn't seem very specific in the NMA.

28.19:21: The section on critical habitats is under-emphized and contains information on the importance of lagoons and bays to waterfowl and shorebirds, and the nearshore to overwintering species of seabirds.

Sea otter does not include the recent 1982 survey information, conducted by GSPEP UP-28 (IC-211). During winter, the sea otters, mainly adults fromraft communities, move off the ice of approximately 700 animals was reported in winter lagoons within the lagoon in June 1981. This work, like Schofield's, studied the seasonal movements, immature-offshore patterns of abundance and provided some information on this species of concern.

See Far's recent final report (NM 611). The pressure on the food resource is also coming from other benthic feeding species. Nothing is believed to take place in the water near the ice, with the exception of king crab and Dungeness crab, being mentioned that right whales are plankton feeding beluga whales.

What is meant by a "subsisting" summer population?

Groundfish fisheries do take place year round.

Salmon runs and spawning streams or the Peninsulas should be shown on their fishing areas identified.

The statement of what the "flatfish" category includes is in error from the mention of perch removed.

Here it says there will be 5 exploration wells; Table IV-3-1 says 8.

How can the expected number of "exploration" be different for other resource estimates in the same.

Good comparison of numbers of expected and observed spills in Cook Inlet and Princeway Bay.

Table IV.4-1: The oil spill trajectory simulations heading should indicate which is subject of the chapter.
b) Salmon existence - How well does the experimental evidence describe the potential prevalences of delays in migration or returning adults and possible late arrivals on spawning grounds? How could improved information on the effects of predation on salmon be affected by avoidance of spawning grounds to regions of lower predation (food abundance) quality? What are the implications of experimental studies on juvenile salmon and what affects the behavior of feeding and growth? What are the affects of predation on salmon? These questions are especially pertinent as all such activity is proposed in the D1S for periods of salmon occurrence.

c) Harrowing and capsias. What are the impacts of alighting optimum spawning habitats and toxic and sublethal exposure to spawning fish?

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Days and inner Bristol Bay (Tagish-Goose Bay) for spawning. No king crab larvae have been found inside the 20 m depth in Bristol Bay. Most inner crab larvae are abundant beyond the 50 m and the 70 m contours. Are these spawning habitats in the BSB? There seems to be some confusion between offshore and coastal data especially as they pertain to biological law. Most salmon runs are usually well-mixed and quite turbulent.

p. 14-75: As Nelsen et al. (1979) were working with juveniles, the argument presented here regarding salmon sensitivity to exposure to discuss the disadvantages in predicting the effects of exposure to both in the long and short-term is confusing as presented.

p. 14-76: The seasonal population of use and different coastal salmonids by the various salmon species (including juveniles and adults) needs to be amplified. Seasonal fluctuations are affected from year to year by changing environmental conditions. Different salmon species may be substantially impacted by oil spills in the NSR. The risk concept must be evaluated in the D1S with respect to regional populations and migrating juveniles and adults. This would include discussions of possible impacts to Alexander Peninsula stands 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?

p. 14-77: Information about juvenile outmigration obtained to date pertains mainly to sockeye salmon. Much has been obtained beyond the 20 m isotherm and little something has been conducted west of Port Moller. The survey was restricted to the period June-August. Two juvenile chum salmon have not been sampled in these areas in late April and May. King and chum salmon are believed to migrate through the very nearshore (10-12) depth portion of the edge near July and August. The movement of drift and eddies has not been well-documented due to their small scale and location. Nor is the outmigration well-documented, although it is thought to be similar to that of the sockeye but later in the summer.

p. 14-78: p. 14-78, 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 move serve.

p. 14-79: A pipeline break on land could spill oil into upstream salmon waters.

p. 14-80: 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 3 point

14-8-1 Table IV-15: Do final oil spills in the same thing as combined probabilities? If so, last should be consistent.

14-9-1 IV.8.8: The site specific analysis is totally based on the MMS spill risk analysis. The importance of salmon fisheries in

Bristol Bay and the importance of the fishermen's issue this is inadequate. The seasonal description of harvest

and travel and severity considerations.

14-9-2 We hope the discussions should be updated due to its importance

14-9-3 as a migratory corridor importance for both juveniles and returning adults.

14-9-4 A. IV.8.17: Port Moller salmon stocks and populations and their

vulnerabilities must be better described in the DEIS as they appear

14-9-5 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 affects of small cumulative oil spills should be considered.

14-9-6 IV.8.18: Possible effects of seismic activities on salmond

population, especially in the Port Moller area are not well

described in DEIS. Some section in this chapter is not very convincing as to what level

of impact might occur.

14-9-7 A. IV.8.20: Without information on the potential effects of oil spills, the Mendenhall estuary is in danger. This means that the impacts

assessed here are not particularly well done. Given the monetary value of these fisheries, this section needs extensive revision.

14-9-8 An oil spill in the Port Moller area could impact a variety of age classes.

14-9-9 Since they are repeat spawners, losses might be lesser. However,

severe reductions in the spawning population could result from a spill

year class reductions could result from larval and juvenile

losses later in summer. What about avoidance and oiling of spawning

hatchery eggs and larvae not represent the age classes.

14-9-10 A. IV.8.21: McRae and Valentine, 1981 should be Easter and Connor, 1979. Also this exposure is for 6 days. "Methyl" usually refers to

methyl mercury.

14-9-11 A. IV.8.22: 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 specific information was presented on this spill reducing these stocks would likely destroy the

fishery operation.

14-9-12 What is the basis for protection that herring stocks in Port Moller

are no longer affected from Harlan? 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 ADFG.

14-9-13 P. IV.8.23: Where is discussion of ADFG CDF's spill oil on place?

14-9-14 Correlation between acoustic hydrocarbon concentration in sediments and invasive amphipods in flatfish? Correlation between exposure to

acoustic hydrocarbons and decreased fecundity in flatfish?

14-9-15 P. IV.8.26: The groundfish section is presenting a list of misinformation

and conjecture. Either needs to be rewritten or include many more references

or both. The section is not complete and the MMS needs to spend more time on

14-9-16 P. IV.8.29: Seasonality of groundfish occurrence in the MBS and adjacent

waters needs to be further reviewed. Which species overwinter

in the MBS? 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.

14-9-30 P. IV.8.29: The entire section on red king crab needs to be revised for the PTE. 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 DEIS 86 609

and 631). Given what is known about the reproductive ecology of

this species (that is, it is contained within relatively narrow geographic

boundaries in the MBS). It's commercial value, 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 elvers and shrimp. More documentation is needed.

14-9-31 P. IV.8.30: Possible effects are too easily dismissed. An asshole

who could keep oil directly over king crab making, hatching, rearing

areas with disastrous results.

14-9-32 P. IV.8.34: Why isn't the magnitude of the effects on king crab identified

as DEHSE, which is what the discussion implies.

14-9-33 P. IV.8.33: Information about the juvenile king crab habitat

is more available than indicated in the DEIS. Important rearing areas

are apparently located directly offshore of Port Moller and in the west

Bristol Bay. These areas typically consist of a rock/shingle/rock shingle

substrate that affords shelter and appropriate food resources for the juvenile crabs.

14-9-34 P. IV.8.34. More discussion is warranted on the hypothesized reasons

for the acute decline in the Bering Sea red king crab population.

14-9-34 P. IV.8.34: More discussion is warranted on the hypothesized reasons

for the acute decline in the Bering Sea red king crab population.

14-9-35 P. IV.8.34: More current information is available on sea otters.

14-9-36 This species occurs in high numbers and densities inshore of the proposed


leasing area, and letting losses might be greater than indicated in the DEIS, especially if all reached Bencivenga Bay and Zeeomz Lagoon (including the fishing coastal area) during spring and summer months.

P. IV. 8.5: Even "very transient and brief in duration" noise can affect whales. The author suggests that such noise could have harmful effects. It should not be assumed that the Marine Mammal Protection Act will prevent this, as enforcement in remote and unknown areas is unlikely. Disturbance effects could well be major at local rookeries. Also, there has been insufficient justification for the statement that the frequency of disturbance events would be low. Many birds fly past daily can be expected.

P. IV. 8.57: If a primary source, i.e., someone harasses Gelrite and St. Agatha is referenced, the statement can be changed to "do evacuate marine quickly."

P. IV. 8.57: The whales were seen swimming through the deep area, not through the oil as stated here.

P. IV. 8.6: The data does not indicate that the acoustic energy is high, but only widespread. The decline levels are usually not far above ambient. There is a distinct "high frequency" and "high degree" in the area, but it is not possible to judge tolerance, as there are no guidelines for whales. Other actions such as change in oil rate, socialization, behavior, and speed can occur near and at greater distances. Also, correct the text to read "North Alaskan Basin" rather than "St. George Basin."
14-120

F. It. J.A and H. Same comment as page for right whaler.
Section V: Constitution and Organization (pp. 14-1 to 14-20).

14-119

It is stated here that the size of the original planning area was considerably greater than the area analyzed in the proposal.

APPENDIX

UNPRODUCTED MATERIALS IN THE NORTH ALASKAN BASIN DEIS

Several major OCEAN studies that were or are presently being conducted have not been included in the North Alaskan Basin DEIS. Many are compared with the library resources of British Roy and consist information pertinent to the leading action that is unavailable elsewhere.

1. ND 447. Environmental Characterization of the North Alaskan warrior region. 1986. Prepared by Tenth Laboratories Inc. This two-volume Final Report provides a comprehensive literature review of the North American Basin, including a review of existing regulations, a description of the area's geology, and a discussion of the environmental impacts of oil and gas drilling. Volume I consists of an Environmental Summary, a discussion of the area's geology, and a description of the environmental impacts of oil and gas drilling. Volume II consists of an Environmental Summary, a discussion of the area's geology, and a description of the environmental impacts of oil and gas drilling. Volume II is an annotated bibliography comprising almost 500 published and unpublished literature sources.

2. RU 539. Distribution of Brad King Crab Larvae and Juveniles Along the North Alaskan Shelf. 1984. Prepared by VES, 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 the hatching that occurred throughout the area, as the same hatching may have occurred at the same time to the north in Inconn Bay. Larval growth rate was found to be greater in the coastal area, but observation of the normally warmer near surface temperatures in this area earlier in the season. Larval densities were low throughout the continental shelf area, but were significantly low in Crooked Bay from Forte Head to Crooked Island. The greatest densities were observed in the upper middle area where prevailing currents did not deliver large larval to optimum substrates where juvenile survival is maximized. The region of highest larval densities was collected to investigate possible connections between young crab and gravel/shell substrates. Gravel sediments are common restricted in the coastal area and were found in the Port Moller and Cape Sanvito region and were more abundant in the central and western areas of the study area. Larvae common over the substrates they included tube worms, snails, gasteropods, hermit crabs, and attached clams. Virtually all sediments at or deeper than 750 m were composed of sand. All juvenile king crab capture were found inshore of 750 m. Juvenile (less than 20 cm C.L.) were most abundant off Port Moller, Cape Sanvito, Port Hedley and Wrangham Island in Inconn Bay. The results of this study should be viewed as preliminary as they pertain to king crab mortality. Further identification of juveniles in these selected benthic habitats is needed. It is hoped that these can be accomplished on an opportunistic basis with other covering OCEAN studies in 1985, given the depressed nature of the red king crab population at this time.
3. RU 659. Seasonal Fish Use of Intake Habitats North of the Alaska Peninsula. Ongoing Study by James & Moore. The project is currently entering its third season. During 1980 more than 20,000 fish were captured along six transects between Port Halden and Unalaska Pass. Most sampling was conducted beneath 70m depth due to a drift of fish information from this zone. Yellowfin and rock sole dominated bottom catches in contrast to Pacific salmon and rainbow trout dominated midwater catches. The seasonal distribution of the inshore chinook salmon was the emphasis of this work. Special emphasis was given to the bottom species and prey relationships including the acquisition of much new information. A comprehensive review of the first year’s work was presented in April. The second year of the study will focus entirely on salmonids. The hypothesis offshore movement of fish between the Port Moller region will be explored this summer. Reduced fishing levels will only allow sampling for a 30 day period in 1980 (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 St. Marie and Unalaska Lagoon. The hypothesis of offshore movement of sockeye in the Port Moller region will be explored this summer.

4. RU 658. North Alaskan Shelf Ecosystem Characterization Study. Ongoing Study by Brown. The project is in its second year and is studying the ecological processes in the Unalaska Lagoon to Port Moller region. Particular emphasis is being placed on northern 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 abundance and biomass 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 1980.

5. RU 609. Distribution and Abundance of Decapod Larvae in the Southeastern Bering Sea. 1980. Date of work: (unspecified). This final report provides information on larval decapods and some possible ramifications of oil and gas development in the area of the North Alaskan Shelf lease areas. The biology and fisheries of major decapod groups are discussed. Information is presented on king, Tanner, and other crabs, and shrimp and hermit crabs. Data on larval distribution and diversification relationships and planktonic adult occurrence, molt frequency, and annual variation in physiological and biological factors, are included. Preliminary plans of planned OCS activities in the southeastern Bering Sea. Literature on all taxa to Crustacea is reviewed.

6. RU 623. Ecological Characterization of Shallow Subtropical Habitats in the North Pacific Ocean. 1983. Prepared by: VAPECO, Inc. This study is intended to describe the composition of shallow subtropical fish communities in the North Pacific Ocean 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 Alaskan Basin during July-September than at other times of the year. It is hypothesized that otters move to the south Alaskan Peninsula during the winter through False Pass and Unalaska Pass or they move west in the eastern Alaskan Islands with advancing seasons.

7. RU 624. Feeding Ecology of Juvenile King and Tanner Crabs in the Southeastern Bering Sea. Prepared by: K. P. Peterson, Economics Laboratory. 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 Alaskan Shelf lease area in June, August, and October. 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 cobbles and rock habitats with abundant associated epifauna. Diet feeding was observed in juvenile king crab with peak feeding occurring during July and August. Juvenile tanner crab were concentrated off Port Moller in August at 63.0 and 11.2% dry weight per gram crab wet weight per day, respectively. The caloric intake by juvenile king crab were 17.5 and 62.4 calories per gram crab wet weight per day in June and August, respectively. Two polychaetes, a sand dollar, and a bivalve accounted for 92% of the soft tissue dry weight of 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 unidentified 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 Bering Sea Region on the Commercial Fisheries in the Bering Sea. This is an ongoing study by BP/SAFECO. The biological impacts of various hypothetical oil spills are predicted through numerical studies and computer simulations. The spill sites are positioned along the 50km contour off Port Moller, Port Halden, and Cape Newmann. 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 spills have been modeled using state-of-the-art algorithms generated by (SPAM). The impact of oil spills on the commercially valuable or ecologically important species are considered in the analysis. The work has involved the preparation of a comprehensive species accounts and several new computer routines. Biological losses are estimated for egg and larval stages as well as
In late blooms for other age groups, the extent of test is compared to test spillover for that age group in the model. The test spillover was also discussed specifically as they apply to integrating inflow stocks. The test work has resulted in the development of an algorithm, based entirely on empirical data, to study the settlement of oil and its effect on fish population. Simulations suggest this is where ecosystem impacts are most long-lasting. In fact, this work was not available for inclusion in the DEIS at the time it was being written. The report should be available in June.

9. By Dils. Modern Populations, Migrations, Demography, Immigrants, and Historical Status of the Pacific Valves. 1986. Univ. of Alaska [fac]. This report is based on a lifetime of work by the Dils. Their work is not directly relevant to the overall study, but their work is unique and deserves mention. The report provides valuable information about this species in Alaska waters. The final report addresses potential B3 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 settlement processes active in the coastal portion of the DEIS study area. This work was conducted in the early 1980s by PEM as part of the OCEAN-USP program. The results of this study in conjunction with ongoing projects of the ONS (on suspended solids 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 source of life-history information for fisheries resources, summary documents have been used and cited frequently in the descriptions of fisheries resources (Sec. III.B.3). Summary documents are not meant to be considered as original research; they are cited as the source of the information used. Summary documents, such as the one by Thorsen et al. (1986), are valuable in the assessment of information gathered by experts; these documents often include those who have gathered information in original research. We have not cited any 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 mixtures specified by calculated 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 1-66, 4-6, 4-111, 6-120, and 6-125. The discussion of hydrocarbon concentrations in the water has been expanded in Section 19.3.1 and also further developed in a nearshore-spill scenario concerning the Port Dollar area which has been added to the DEIS.

NOAA states that, "If it is assumed that spilled oil remained offshore the ONS analysis is probably accurate." The oil-spill-predictive analysis (OSRA) does not make this assumption, but rather calculates shoreline or nearshore contacts (the model assumes that it is a trajectory approach within 1 to 3 km of the shore, then would be contacted by the spill). For the proposal, the probability of land (including the nearshore) contact with spills of 3,000 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 ONS analysis should be considered accurate.

Also note that modeling spills in the surf nearshore) area would provide only minimal improvement in the analytical precision of the OSRA analysis. In the absence of a surf-zone model, the OSRA...
analysis assumes that the entire land segment could be contacted by the coastal seas oil-spill trajectory. The analysis of effects from this spill contact is predicated on the assumption that the entire land mass (in kilometers) is contacted. This latter assumption is conservative and leads to an overestimated use of the surf model, and to a loss of 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; cf. 1983a, b).

Punctin (1966) analyzed Alaskan weather data of many years and concluded that Alaskan has no spring season. Subsequent to the 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.

Response 14-7

The MDS does not agree that the analysis in the EIS has been "skewed toward the general and discounted for specific," and takes exception to the inference that MDS analysts would bias the analysis toward lower effects. The commenter 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 justifiable to declare that MDS analysts would bias the analysis toward lower effects. 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 protected 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 proposed (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 life stages 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 low. 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 (Salal 92) area is leased. The maximum case would not be confined 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 possible 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 OCSAF studies pertaining to the North Aleutian Basin have been reviewed and, where appropriate, information has been incorporated into the text (Secs. 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 out-migrating.

Response 14-12
This concern is addressed in Responses 1-2, 1-3, and 1-4.

Response 14-13
The NMS agrees that a clear 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 life stages (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 salmon 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 devalue or deprecate the importance of the special habitats identified by the commenter. For additional discussion on the analytical approach in the EIS, refer to Response 14-9.

Response 14-17a
The Summary of the EIS for Salk 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 conjunction with the proposal (Sec. IV.B.3).

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 NMS for the period of delay is included in Section IV.D.

Response 14-17b
Table 5.3 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 NMS 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 Area was requested as a 50-kilometer (25-nautical mile) deferral along the Alaska Peninsula and the Aleutian East CGS Board requested a 50-kilometer (25-nautical mile) deferral along the peninsula. 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 the 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 follows the procedures in Section II.C.1.d. (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 platform 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 Unalaska Pass.

Response 14-24
The commenter confuses two ITL’s. The ITL on endangered whales ‘...would effectively reduce the risk (due to the issued ITL’s) on endangered whales...’ The ITL’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, [Pur Seals, Other Pinipeds 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 petrology 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 GSI'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 sections 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 Sibbald 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. Some concern that ecosystems and habitat linkages have received little attention in the EIS is addressed in Responses 14-9 and 14-14.

Response 14-27a

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.

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 PEIS) Additional information can be found in other references cited in Section III.A.1.c. of this EIS.

Response 14-27b

This concern is addressed in Response 6-117.

Response 14-27c

This correction has been made in the PEIS.

This information has been incorporated in Section III.A.3. of the PEIS.

Response 14-28a

The referenced sentence and the cited sources were reviewed; the sentence was found to be a correct and referenced summary of compatible findings by McMurt (1981) and Overland and Pease (1981)."
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 bullhead has been incorporated in the FEIS.

Response 14-32
Available information on location of concentration areas of the various life stages 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 eel" was taken from Page 100 of NOAA Technical Memorandum NMFS F/AIR-5, by Norris 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 safflsh, the FEIS did not state that the North Aleutian Basin is of "... great importance." For example, the description of safflsh states, "Although present in the Bering Sea, the greatest abundance of safflsh is in the Gulf of Alaska (Norris 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 safflsh 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 OCEAS.

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.
Studies on the distribution of various life stages of dungeness crab have not been extensive enough to establish that, in the North Aeotarian Basin, they are limited specifically to "... nearshore in the more rocky substrate habitat present north of Unlak Island." 

While much of the emphasis of this document may be on the North Aeotarian 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.

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 DEIS.

The text has been amended to address this concern (see Sec. III.C.1.e.1 of the FEIS).

The text has been amended to address this concern (see Sec. III.B.3 of the FEIS).

The text has been amended to address this concern (see Sec. III.B.3 of the FEIS).

This concern has been noted.

This typographical error has been corrected to read "subsidiary" in Section III.B.4.a (Grey Whales) of the FEIS.

Section III.C.1 of the FEIS has been amended to indicate that the groundfishery occurs year-round.

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.

The text has been amended to address this concern (see Sec. III.C.1.e.1 of the FEIS).

The text has been amended to address this concern (see Sec. IV.A.1 of the FEIS).

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.

The text has been amended to address this concern (see Sec. IV.3.e of the FEIS).

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.

In the FEIS, the source for Table IV-3 has been reidentified as Hone & Peltz (1996).
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.

The text has been amended to reflect this concern (see Sec. IV.A.5. of the FEIS).

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.

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.

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 at 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 impacts of tankerings out of Balboa Bay.

Ioga 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 transshipments terminal at Balboa Bay—could have cumulative economic and sociocultural effects on the city of Sand Point.

This typographic error has been corrected in the FEIS.

These tables from Thorsteinson and Thorsteinson (1982) and Moore and Deyer (1974) are used as a source of the general ranges of sensitivities of various ecological groups and life stages. The tables are not used as species-specific LC50 values for predicting accurate effects following a known exposure concentration and duration.

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.

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.

The text has been corrected to read "MUS" and original sources have been cited (see Sec. IV.B.1.a.(1) in the FEIS).

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.(1a) and IV.B.1.a.(1b).

Response 14-49

This section is organised 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 accumulations 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 regime is discussed in Section IV.B.1.a.(1b) (Benthic Habitats), and the relationship of the effect and depth of discharge is discussed in Section IV.B.1.a.(1a) (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 concerns regarding potential effects of dispersants on marine life 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 NMS acknowledges that three main oceanographic domains—coastal, shelf, 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 section. 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 fishery resources.

Response 14-72

We agree that plankton may metabolise 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.1.d. Additional information on potential effects of sedimented oil on benthic organisms has been incorporated in the EIS. Section IV.B.1.a.(1) summarizes available information on sedimentation of oil and possible effects on benthic biota, from sources available through 1994.

Response 14-74

The EIS considers water 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 EIS).

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 life stages of each fishery group (e.g., salmonids, halibut, 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 species. However, localized effects are identified if there is some indication that an oil spill would occur and contact areas of relatively high risk. Discussions of effects are given in the EIS. The EIS concludes that oil spills would have an extremely low probability of occurring on the Lease Sale Area.

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 simulated 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 means 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 discharge, 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 OSHA 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 these analyses. Oil transport and fate are described in Section IV.A.1.c and are incorporated into the fisheries-resources analysis, as appropriate.

Response 14-83

The use of Unmak Pass by migrating juvenile salmon has been incorporated into the text of the FEIS. Although the potential for delayed migrations or sublethal affects have 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 1,500,000 chum. Total 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 Palmer Lagoon, Bear River, and Inliss gillnet fisheries. Bristol Bay sockeye salmon remain some distance offshore until they are 51 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 necessary 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 experi-
ence. The information provided in the text substantiates the conclusion that seismic surveys would have a negligible effect on fisheries resources.

Response 11-86

The text has been corrected to read, " Hazel and planktonic larvae. Specific life-history characteristics of each of the four species of clupeiformes discussed here have been incorporated into the analysis (i.e., offshore concentration of adult herring at the surface, high natural mortalities ofroe and larval herring, consolidation of juvenile herring at the mouth of bays prior to offshore migration, growth with shallow-shelf spawning of capelin, and anomalous characteristics of boreal needs 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 11-87

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 the NEIUS were derived (along with spawning stocks) from the NEIS. The NEUS includes a discussion of the potential effects of herring on capelin spawning habitat.

Response 11-88

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 11-89

The text has been revised 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 assessed in Section III.C.

Response 11-90

The text has been amended to address this concern.

Response 11-91

In 1978, the Amoco Cadiz spill lost 216,000 tons of crude oil and 4,000 tons ofunker 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 150 kilometers. This spill volume is a great deal more than has ever been lost from U.S. offshore operations oil transport.

The plants, Pseudomonas aeruginosa, were collected from two relatively conserved estuaries, whereas Alaska plants inhabit the more open and turbulent eastern Bering Sea. Presumably, plants collected for analysis of the effects of the Amoco Cadiz oil spill were adults. These plants, however, differ from Alaska plants, P. quadrifurcata (Valles), 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 Atlantic Basin oil and gas development, estimated volumes, and oil spill trajectories, contact with Alaska plants and other flounders is unlikely; if it should occur, adverse effects on the populations would be minor.

Response 11-92

For documentation of the information used in the groundfish analysis, refer to references cited within the analysis and in Section B.2 (description of fisheries resources) and Section B.1.2 (general discussion of effects). Available information has been incorporated into this analysis, and would have been presented to " ... include many more references [if they exist] by the comment..." as suggested, had additional pertinent references been noted by the commenter. Information on groundfish-nursery use of the area was taken from the National Marine Fisheries Services 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 11-93

Seasonality of groundfish occurrence in the North Alaskan 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 life stages 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 11-94

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 5-2).

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 oilseep 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 MMS 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 5-1, 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 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 areas (approximately 2 million hectares) since the one reported in Berzin and Revin (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 scenario. 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 (Abram 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 Alaskan Basin might not interact with right whales in other areas.

Although no direct monitoring of seismic testing on right whales has been attempted, extended data from Richardson et al. (1984), Fraker et al. (1982), and Reeves et al. (1983) suggest that right whales in the region exhibit similar behaviors and that the behavioral responses of right whales can be extrapolated to right whales in general. In summary, it is very unusual to find right whales in the North Alaskan 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 NMS Biological Opinion, the NMS has developed an IEL 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. (See Appendix G, Table G-31.) The maximum percent probability of oil contacting Resource Area S, which is used by fin, gray, right, humpback, and sperm whales; ball's and harbor porpoises; 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 investigations 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 250-300 miles from the oil spill. Kent et al. further indicated that only one-fifth of the population migrated far enough west 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 text in the text above. These investigations 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 250-300 miles from the oil spill. Kent et al. further indicated that only one-fifth of the population migrated far enough west 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 Alaskan 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 Alaskan 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 (Gest and St. Aubin, 1983), their populations are unlikely to be affected by spilled oil.

During the summer feeding season, interaction of nonmammals with cetaceans or their habitats with oil spills originating in the North Alaskan Basin is generally very unlikely (less than or equal to 1%).

Direct oil-spill consequences to zooplankton or other cetacean food sources are considered to be minimally affect summer feeding cetaceans due to the zooplanktons' rapid fecundity and the secondary food source they provide to most nonmammal cetaceans.

If development of hydrocarbon resources occurs to the extent estimated (see Sec. IV.A.3.), and if associated spill rates occur (see Sec. IV.A.3.), there exists a generally low probability of oil contacting nonmammal cetaceans or their habitats. Since most nonmammal 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-4, Appendix G; however, spill points have been added to the text of the PFS for clarification. There are no time periods associated with spill-launch points—only targets (see Sec. IV.B.1.a.4).
of oil and 1.20 TCF of gas (Table II-l). 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.F.I.B. 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.I.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. Adverse 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 FEIS 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 individual endangered species' has been the description of some effects in Table 5-2. Because most endangered whales appear to be increasing their numbers since full protection began, small losses to a recovery population should not effect a population overall. The gray whale is an excellent example of how the loss of individuals (209 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 MEA 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 estimates (759 MBbls) 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 VII 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 32.3 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-1c-1). This area, representing approximately 17 percent of the planning area, has been analyzed in this EIS.
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) O.1 and Gas Lease Sale # 92 in the North Atlantic Basin.

The proposed lease sale encompasses approximately 5.6 million acres ranging from 11 miles to 114 miles offshore, in water depths from 0 to about 100 meters. The sale is tentatively scheduled for December, 1985. In addition to the proposed action (Alternative I), the DEIS evaluates three other alternatives: 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 1% of the proposed sale area.

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. Specifically, the analysis of the impacts of oil and gas development, particularly the risks of oil spills, is generally inadequate for framing leasing decisions and evaluating leasing alternatives. Further, the DEFIS does not fully make a case for selection of either Alternative I or Alternative IV.

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 environmental impact of Alternative IV to delay of sale. The Northwestern Bering Sea and Bristol Bay are among the most biologically productive areas in the world. Delay of sale would provide industry more time to gain experience in other Alaska OCS lease areas and to identify the risks that eventual oil and gas development may pose to the marine resources of the North American Basin. Our latter concern about Alternative IV is that the number of enclosed conditions. Finally, the latter outlines the relation between all spill risks and oil and gas contingencies 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 areas for salmon, halibut, and capelin are located along the north side of the Alaska Peninsula (Figures 11-1, 11-2, 11-9). Juvenile salmon enter their rapid growth period in nearshore waters in August (p. 11-1, 11-2). The salmon migrate along the north side of the Alaska Peninsula toward the Bering Sea. The dominant salmon species in this area is the chinook salmon (Figure 11-1). The nearshore waters, estuaries and coastal areas of the area are very important for juvenile salmon, staging for migration, and overwintering (Figures 11-1, 11-2, 11-9). Sea otters occur in medium to high densities in the vicinity of Unaska Island, Iliamna Lagoon and Port Moller (Figure 3). The endangered gray whale migrates along the Peninsula coast, and Iliamna Lagoon and Port Moller are areas of frequent summer use (Figure 3), where 10% of the population feeds (p. 11-4).

Because of the importance of these nearshore waters, MMS should consider further restriction of these tracts from the southern portion of the proposed lease area. Although the Alaska Peninsula Deferral eliminates tracts within 30 kilometers of the Peninsula, it is not totally clear that it provides sufficient protection for oil spills for the biological importance of nearshore waters. For example, the DEIS states (p. 11-4) that the choice of Alternative IV would reduce the conditional probability of an oil spill on the nearshore source area around Port Moller within 10 days from 99.5% to 49%. Yet it is clear from Table 6-2 that moving the southern lease off-shore further out (thus eliminating launch points 82 and 83) would further reduce the probability of an oil spill contacting the source area. For spills, the effectiveness of the response would vary with the extent of the spill, the currents, and the experience of the personnel. The DEIS also states (p. 11-4) that the sale would remove a significant portion of the lease tracts less than 30 meters in depth, as requested by the Alaska Salmon Fish and Wildlife Service. Oil spill response is, however, described as ranging from 30-100 meters (p. 11-4, 11-5). We believe that appropriate initial steps in response to oil spills would involve reconstitution of the southern boundary of the lease sale to eliminate areas less than 30 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 state conditions typical of the area, little containment or cleanup of large oil spills is likely. If Alternative IV is to be the alternative chosen, a buffer zone should provide for meaningful buffer zone protecting the biological uses of the Alaska Peninsula.

The DEIS is not clear what the choice of Alternative IV, as it is currently designed, would mean for oil and gas resources. Table 11-1 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 IV. But Table 11-4 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 alternative and a revised Alternative IV should be clearly established in any revised DEIS.

SUMMARY OF DETAILLED 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:

--- 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, would weaken the conclusions drawn regarding the impacts described in the DEIS, particularly with regard to oil spill effects.

--- The descriptors (MAJOR, MODERATE, MILD, NEGIBLE) used in assessing the effects of the proposed alternative are inappropriate. The descriptors should be more clearly delineated and used to indicate the effects of various actions and their implications. For example, the effects of spilled oil, the effects of seismic activity, grilling, and other activities, and the effects of drilling, all spill oil.
-- The DEIS does not adequately consider indirect impacts on higher trophic levels resulting from the loss of key prey species or their habitat. It also omits the possibility that the proposed actions might 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.

-- Although it is the postulated site for the LNG plant and the transshipment terminal, it is an area of concentrated tanker traffic. The shores and waters of the south side of the Alaska Peninsula area 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 MMM on February 12, EPA raised issues regarding the oil spill risk and all spill trajectory models used in the DEIS. Although correspondence between MMM and EPA staff have addressed many of these issues, some concerns about the application of the model still need to be discussed.

NOPSE PERMIT ISSUANCE UNDER NMFS (1)

EPA's position in the configuration of the North Alaskan Basin lease sale and, in part, from our statutory responsibilities to issue National Pollutant Discharge Elimination System (NPDES) permits for discharges from U.S. oil and gas operations. Once EPA promulgates New Source Performance Standards (NSPS) for offshore oil and gas discharges, those responsibilities will be substantially expanded by EPA's need to comply with NMFS in issuing permits to "new sources" (those dischargers covered under NSPS). Since EPA applies the "new sources" requirements to those segments of the effects of the permitted discharge on marine birds and water quality, the broader scope of environmental conditions evaluated under a NERP permit than in a NPDES permit decision to which NMFS applies, the Agency may consider the risk of all spills in deciding whether to condition or deny a NPDES permit in specific areas. For the North Alaskan 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 is a factor not considered by EPA in the issuance of any NPDES permits.

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The oil and gas resource potential of the North Alaskan Basin against the important biological resources of the area. In particular, the analytical basis for evaluating the effects of all 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). However, CEQ needs to be satisfied that the proposed actions are not likely to cause significant impacts to the environment. If CEQ is not satisfied, it will indicate to EPA that the revised action alternatives do not have any risks to be environmentally acceptable. Thus, a revised proposal may also be a candidate for referral to CEQ.

We appreciate the time and effort that has been devoted to this proposal. The time extension was, in part, predicated on scheduling a meeting to discuss the EPA contractor report on the oil spill risk model and trajectory analyses used both in this DEIS and in the US.

Although that meeting could not be scheduled prior to submitting our comments on this DEIS, we appreciate the excellent cooperation and the flexibility shown in scheduling a meeting to receive and discuss our comments. This meeting provided us with additional information concerning which we are satisfied with our comments on the DEIS.

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 MMM 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 the DEIS. If you would like to contact MMM staff to arrange this meeting, in the interim, questions concerning our comments may be addressed to Marvin Lufkin, Deputy Director, Office of Federal Activities, 301-427-7597, or Marcia Lefkovitz, Office of Region 3, 301-427-6629.

Sincerely,

[Signature]

Marvin Lufkin, Deputy Director
Office of Federal Activities

Enclosures
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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 OSPRA Technical Problems

The OSPRA spill risk analysis (OSPAR) includes an estimate of the probability of one or more spills occurring in a risk analysis per year and an evaluation of the consequences of such an event. OSPRA did not include an analysis of the potential for smaller spills. However, the last few months, EPA has completed a detailed review of the OSPRA spill disposal procedures 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, 1989. EPA and MMS staff were unable to meet to discuss these issues and we have not, therefore, provided any detailed comments on the OSPRA in this DEIS. 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 OSPRA to this DEIS.

2.2.2 Other OSPRA Considerations

2.2.2.1 General Comments

No spill trajectory calculations were made for the southern side of the Alaska Peninsula, however, a major port for tanker loading is expected in Beluga 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.

The cumulative case scenario for the Sale 92 DEIS appears to be different from the cumulative case scenario described in the Sale 90 DEIS. If these scenarios are different, the differences should be noted and explained and elaborated.

Estimates of production from other lease areas in the Bering Sea have been made 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

2.2.2.3 Cumulative Effects Assessment Assumptions

The DEIS does not consider trajectories of all spills arising from spills in and south of Bering Pass. However, 2 (1.78) of 14 (10.9) spills are anticipated between Bering Bay and southem markets. The fate of all spilled north of the Alaska Peninsula should be considered in the cumulative impacts assessment. On page 113-114 of the EIS states that "More fish are harvested off the southern side of the peninsula than in the northern (Fig. 15-12), and the species composition of the catches of these two areas is quite different."

3.2.3 Impact of Oil Spills

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 losers of food supplies may have an effect. The walrus population, for example, is already considered to be highly sensitive to food supplies. Many of the ‘non-progressive’ routes, and losses of food supplies near nesting colonies is a powerful significant impact. Oils found in the Arctic and the local for long periods of time are known to have a toxic effect on walrus, and other arctic species such as polar bears, seals, and some lemmings. The effect of this toxicity may vary from a delay in the development of young walrus to a reduction in growth rate, and even to death. The EIIs should not generally assume that alternative feeding areas that are available when a class of impacts is occurring. The feeding habitat is disrupted or damaged by the spills and oil-related activities.

2.3.2 Impact Averaging

The DEIS practice of determining the magnitude of impacts (e.g., M50M, MODERATE, MODERATE) as if it were a mathematical "mean" of the impacts posed by different activities would understate the impacts. In some cases, the DEIS may find that separate activity may have MODERATING effects on a particular resource, but that "overall" the risk to the resource would be moderate. This approach for calculating the magnitude of impacts 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 measure is useful in describing impacts.

The DEIS also summarizes the impacts over several different species. A good example is found on p. 46-22-26 where it notes that a major oil spill could have a MODERATE impact on red king crabs, but "overall" the impact would be MODERATE on the local population of crabs and other invertebrates. Thus, separate impacts are observed by the DEIS. We question whether the "overall" measure also understates impacts on individual species.

Thus, the DEIS averages the combined effects of various stocks on the impacts and averages impacts across species. It also averages in a third way that is often determined the impacts would be MODERATE based on the fact that only a small portion of a regional population would be affected, that the regional population is very large and that a small total impact on that population in absolute terms. These practices tend to underestimate the significance of the impacts, by doing so the DEIS can then discount them when attempting to use the EII's 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 EII's conclusions regarding the significance of the impacts, the final impact considered by the staff specialists in determining whether the impacts would or could be MODERABLE, MODERATE, MODERATE, or a MODERATE or MODERATE MAJOR in the EII. Similarly, the two often and appropriately takes "effects" and "probability," if the probability of oil 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. For example, the probability of occurrence varies according to the location of the spill, the season of the year, the temperature of the water, and the behavior of the fish schools or whales or walruses. The EII should not generally assume that alternative feeding areas that are available when a class of impacts is occurring. The feeding habitat is disrupted or damaged by the spills and oil-related activities.

We believe the presentation of the effects and impacts of oil impacts could be more clearly presented in this and subsequent EII's in which the effects and their probabilities of occurrence were treated separately. Thus, a more appropriate approach would be:

A. Describe the environmental effects, their potential scope (how widespread they might be), and their potential magnitudes (quantity of where possible).

B. Reach an assessment of their significance (major, moderate, minor, negligible) based on oil impacts.

C. Then provide an assessment of the probability of the effect's occurrence. Then, probability assessment would include an assessment of the uncertainties associated with the predictions (such as error bars or confidence intervals on the quantitative estimates).

The assessment of these risks would face the tasks for determining what the effects will be, to reduce or at least unacceptable levels. Although DEIS documents to date have not addressed this issue, we believe that, as described in the preceding paragraphs, the method of presentation ("averaging" various sources of impacts to probability and summing up a resource's "averaging" impacts over species) blurs the distinction 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 vulnerable as those of the North American prairies and the Northern Bering Sea.

2.4 Development Infrastructure Impacts

The Draft EII provides only a brief analysis of the potential impacts of the infrastructure and gas 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 objectives of this effort would be to determine whether the required development infrastructure (pipelines, port facilities, all transportation facilities, and the LNG plant) could result in unacceptable adverse environmental consequences. If any of the screening level analyses show a negative impact, the DEIS should discuss other development scenarios or measures that would be to eliminate the impacts.

1.5 Water Quality

2.6.1 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.

The discussion of effluent discharges omits mention of test fluids, completion unit discharge, deck drainage, biogeographic element preservation, fluid, cement, and non-contact cooling water. Although relatively minor, these discharges could be costs. Therefore, their presence, quantity, and composition should be included in the discussion of potential impacts.

The DEIS should discuss potential water quality impacts from LNG terminal construction at Baja Bay and construction and operation of the pipeline through Port Mottier 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 Mottier and Hermes Bay and across the Alaskan Peninsula to Baja Bay. Although episodic turbidity may be a natural phenomenon, it should not be attributed to drilling and other construction activities. Impacts from active construction is therefore insignificant. Particular attention should be given to the effects of pipeline construction on red king crab populations and the birds of Port Mottier and Hermes 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措施 could be used to reduce the impact of construction?

2.5.2 MOPES and OCE Requirements

The DEIS should also 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 noted in the Final EIS for the recently deferred Gulf of Alaska /Conoco Inlet Lease Offering, a less significant 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 (JUL, 1984) and a preliminary OCE for this lease sale (Jones & Stokes, 1986), we have identified additional information that is needed for an accurate 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 (1972). 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 evidence of toxins 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 megafauna, especially their spatial coverage, is required. The development phase poses a threat to benthos, either directly from burial or indirectly through cumulative taphonomic or food chain effects. Knowledge of chronic toxicity of drilling muds and produced water, particularly bioavailability, biomagnification and bioaccumulation is limited (JUL, 1984; Jones and Stokes, 1984). Laboratory or field studies have addressed chronic exposure to sediments, concentration (Jones and Stokes, 1984), and Alaskan species form in small subset of the data base.

Bioaccumulation of heavy metals such as mercury, cadmium, and bismuth 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 muds.

Although operational recycling of drilling muds during development drilling may reduce the volume of mud discharged per well, total quantities could still increase significantly. The St. George Basin proposed OCS drilling area (Alaska) and the Gulf of Alaska are geologically similar and therefore have analogous drilling mud compositions. In fact, the sedimentation of the former area reflects the latter in the same saline range as that which the mean case development scenario contemplate, with similar reservoir depths. It would require substantially more wells (20). Our evaluation of that operation, based on data submitted by the permit sponsor, suggests a much lower
but unquantified, recycling rate. That, at this stage in the HCA evaluatin, we believe EPA and WHO are obligated to take a conservative approach to estimating the potential impacts of development and production on the controlling effluent discharges. This suggests that the testing decision E15 should use a high-side estimate of the quantity of materials discharged.

Although recent reports suggest that under normal operating conditions the potential adverse effects from discharges should be limited to within several hundred meters of the point of discharge, the issue remains complex. The possible exceptions to this generalization could occur when drilling conditions differ from normal or when drilling rig is located near sensitive biological areas, or in poorly flushed areas (EPA, 1984; CMC, 1983). Since portions of the North Atlantic Planning Area have low current velocities, drilling muds may accumulate and persist in the Basin. Thus, potential human impacts stemming from ingestion of contaminated seawater must be addressed in our evaluation plans (CCOE under section 403 of the CWA). Production plane operations, the produced (formation) waters need to be characterized. Produced waters are collected at several locations and tested for its quality prior to discharge. However, the production operational parameters are typically not precisely known. The quality of produced water will very significantly depending on the oil bearing formation from which the water is produced. Produced water is normally treated prior to discharge. However, a range of values, for various physical and chemical parameters, based on produced waters from development fields in the OCS and in state waters would describe such inhomogeneity. An indicative summary of the data, as well as a summary of current toxicity information, can be found in our OCS for Gulf of Alaska and Cook inlet (Sale ABT). (Jones & Stokes, 1984b).

15-25

Additionally, the dispersion characteristics of produced waters need better characterization. In general, the dispersion to the ocean, the distribution to the atmosphere, and the effects on the biota need to be recognized. The project will influence the quality of the produced water, which will be characterized by low salinity, high chlorinity, and high acidification, as well as other components. Produced water characteristics will vary depending on the oil production, the natural gas production, and the water volume of the produced water. In general, produced water and its components are not characterized by high state toxicity, however, since methanol is known for its toxicity, knowledge of its distribution and seasonal abundance in the marine area is expected to be major importance (DHH, 1983).

15-26

Finally, there is inadequate information on the complex ecosystem dynamics in the lease area. More data are needed to provide a more thorough understanding of the ecologically important species and food chain associations. This understanding is necessary to estimate the impact of the proposed operations. A typical risk analysis, however, does not address all potential ecological impacts. But a summary of the effects on the development and production phases.

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2.6 Air Quality

2.6.1 General Comments

The Effects on Air Quality section consists of "nitrogen oxides" instead of using the appropriate term "nitrogen oxides" or "oils of nitrogen" when discussing combustion emissions of nitrogen oxides (NOx) and nitrogen dioxide (NO2).

15-29

Nitrogen oxides (NOx) are one of the more abundant naturally occurring trace components of the atmosphere. They are one of the significant precursor gases of particulate matter (PM) and nitrogen dioxide (NO2) emissions. NOx are emitted in the transportation sector mainly as nitrogen dioxide (NO2) from fossil fuel combustion and nitrogen compounds from agricultural and industrial processes.

15-30

Nitrogen oxides play a major role in the atmospheric chemistry of photochemical smog and acid precipitation, and it is sufficiently toxic to animals and plants to warrant an ambient air quality standard.

15-31

As we suggest that the Revised Draft EIS should discuss alternatives in reducing NOx, assuming at least in the short term, adequately offsetting Air Quality impacts. The impact of the cumulative concurrence of particulate impact on NOx cover should also be addressed.

2.6.2 Major Specific Comments

15-32

The DEIS has not present sufficient information to support the conclusion that there will be no violation of state or federal ambient air quality standards or Federal PSD requirements.

15-33

The criteria used in Table 5-2 for categorizing air quality impacts as MINOR or MODERATE should be reviewed to characterize long-term localized impacts and to develop an air quality guideline. The regional characteristics of impacts as MINOR or MODERATE. This is particularly true for air quality and air quality standards. Long-term local violations of air quality standards (MINOR impact according to Table 5-2) 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 shipping operation. A typical risk analysis, however, does not take into account all potential situations. Based on the previous considerations, we suggest that Table 5-1, Summary of Effects for Alternatives I, II, III, IV, be modified to note that MINOR water quality impacts are for the evaluation phase only. EPA does not have adequate data presented in the DEIS to substantiate a "Minor" level of effect for the development and production phases.

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people might be affected by the gas and how large an area might be affected by a gas leak. This gas leak is not considered in the analysis.

Although this type of evaluation would normally be done at the development or production phase of the project, we believe that the earlier stage analysis is appropriate in this instance. The Atlantic Peninsula, as documented in the EIS, which was released on June 3, 1975, is an area of exceptionally high seismic risk. It may be very difficult, perhaps impossible, with the current state of the art, to design and construct LNG facilities that are in the environment which provide an adequate degree of protection to the public. Thus, at least a screen

2.6 Fisheries

2.6.1 General Comments

Although the DEIS adequately considers the 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 invertebrate species have critical uses of the nearshore area, and 2) all spills would have the greatest adverse impact on the nearshore habitat.

15-34

The DEIS assumes that 200 square km area of impact represents only a localized impact zone compared to the North Atlantic Basin. In several cases the GIS notes that a 100,000 t/spl with 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 local oil spills have been documented in a particular area during certain seasons or life-history stages.

15-35

The finding of MODERATE 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. 12C-13, paragraph 7). "Favorable weather conditions are the exception in the Bering Sea. (See, for example, p.11C-12, Table 11-2)."

15-36

The DEIS assumes, without verification, that species with several eggs do not have narrowly restricted spawning habitat requirements. This is not the case. The DEIS suggests (p. 12E-12) that effects of drilling and deposition of several eggs will be limited to the vicinity of the discharge.

15-37

2.6.2 Toxicity

More background information is needed to support the information presented in Table 1V-13. A critical factor in evaluating hazard of material is the relationship between exposure time and measured toxicity. Tables 1V-13 and 1V-14, which present ranges of lethal concentrations for various fish groups and various life stages, give no relationship of the LOS and the material. Another factor that is important in evaluating the toxicity of a substance is the conditions of the exposure (e.g., static, static replacement, flow-thrust, 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 Atlantic 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.

15-38

The table (1V-13) is taken directly from Thorstenson and Thorstenson (with the exception of an error for flatfish 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.

15-39

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 given only a prediction of probable affects. Fish in the lease sale area could have different sensitivities. The original source of the toxicity data indicated that many of the blesses were conducted under, multi-test conditions, "spill clean up, recovery and displacement tests have been conducted under very idealized conditions in controlled, isolated experimental systems." The data presented may not be applicable to spills in open ocean conditions. One 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.

2.6.3 Effects on Salmonids

Impacts of all spills on salmonids are understated. High mortalities in nearshore areas are noted as having a MODerate effect on the, local population. (p. 14-8-15), and this is considered a MODerate effect on the regional population. Korescial salmon tend to be very concentrated as they
leave male streams and migrate along the coast. Although all oil spill's effect may be evaluated, no oil spill could result in severe loss of stocks from particular river drainages that are considered to the marine environment. The stock of oil spill should not be considered a MAJOR impact even on a regular basis.

For and juvenile salmonid in the nearshore area feed on crustacean species that are either epibenthic or frequently rest on the bottom. Important food sources can be killed by oil spills. As noted on p. 11-4, all spills involving upwelling near this area as a MAJOR nearshore area. This is important to consider when the nearshore area where vulnerable salmonid were present.

2.8.4 Effects on Clupeiformes

It is incorrect to assume that all oil spills contacting the nearshore area would affect herring only if vulnerable habitats were present. As noted on p. 11-4, all spills involving upwelling near may result in long-term persistence of contaminated sediments. The heating of spawning activities could be adversely affected even during a winter spill event.

2.8.5 Effects on Groundfish

Groundfish species which are associated with the sediments in the coastal areas for herring, for another in the nearshore environment where turbidity and higher sediment levels could enhance the settling process of oil spills. Oil spill in the nearshore area as juveniles (p. 11-9-25) 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

There is no discussion of exposure of invertebrates and other aquatic organisms to contaminated sediments and tar balls. Juvenile crab inshore shallow areas and associated areas affecting dense populations of thousands per cubic meter. Not only could five-year classes be affected by the initial spill; however, the nearshore area could remain contaminated for many years in the future. The impact of this on the amphipods and infauna populations should be assessed in the Revised DEIS. For example, would contaminated sediments preclude the herring habitat or would the crab still congregate in areas with contaminated sediments and suffer many substantial effects?

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The DEIS appears to deal mainly with floating oil slicks when defining accidental marine mammals, yet an oil spill results in three types of products: oil slicks on the water; dissolves (and) light 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. The type or concentration of dissolvent fractions in contaminated wax (crude oil) is not addressed. Dissolution and potential ingestion by bottom feeders such as gray whales and vaquita is not discussed. Effect of tar balls on short- and long-term benthos mortality or productivity (marine food sources) is also not addressed.

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 IBM biological opinion (p. 19-5-55), on the other hand, states seismic surveys would jeopardize continued existence of 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 interference in par. 2, page 19-5-61, 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 author's opinion concluded would jeopardize gray whale existence. Although the degree to which migration would be affected is unknown, this possibility exists.

The conclusion on page 19-5-64 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 0.01 percent) and "a wide range of probabilities" (0.01-0.99 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 relative frequency of coalescence after a spill is of indirect importance in evaluating cetacean food sources. Fish, squid, and herring would be primary food sources; if harmed, these species would re-establish much more slowly than plankton.

Based on the variance of statements previously made within the section regarding likely or unlikely interactions, the conclusion that oil spills are unlikely to have significant adverse effects does not seem well substantiated.

The conclusion of cumulative affects on page 19-5-75 (paragraph 2) seem full of conflicting statements. Cumulative affects 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 HNMR impact seems dubious, particularly with the right whale population so low as to possibly be biologically extinct.

The statement that fin whales are without the basic conflicts (p. 19-5-74 with statement in Chapter 11, 19-5-20 and graph) which indicates a 95 percent of the list indicates that the spill contact probability is similar to that of gray whales. Oil bloom towards the horizon is likely to collect in gray whale summer feeding areas such as Port Willapa; 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.

Disruption of normal feeding activity or feeling of baleen could do more harm than merely "eliminating blubber stores." Baleen whales feed only in summer. At the end of spring, blubber has already been depleted by three seasons of use. Prolonged impotency of feeding during summer would force whales to enter another winter and fall migration periods without reserves necessary to sustain them, which could easily result in death of the animals.
The salmon and herring fisheries should not be considered short in duration and therefore having low probability of being affected by oil spills. Herring fisheries begin in the early spring and are usually followed by salmon fisheries. Fishing for salmon in Port Moller may continue to the end of August.

We also disagree with the conclusions (p. IV-8-95) 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 on the South coast, where fishermen are restricted by usual site or permit conditions. Several oil spills would greatly increase the magnitude of the impact because of the immediate effects on fishing fleets and in sediments. Furthermore, oil production in the adjacent St. George Basin increases the probability that cumulative impacts from all spills and fishing area restrictions will occur.

On page IV-8-95 the DEIS describes the probability of an oil spill reaching a particular location of the crab fishing grounds. Because crab boats are unaware of incoming ice, 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.

We disagree with the conclusion on page IV-8-95 that losses to the fishing industry due to fish and crab mortalities would be minor (see ‘Fisheries Resources’ section). Port Moller salmon and sablefish could be severely affected by an oil spill. Oil could travel from the Pariser Peninsula to the Prince William Sound area and DEP marine life is threatened by a worst-case scenario. The potential for crab harvest losses alone could be over $1.5 million per year. Marine life can be substantially in a competitive fishing area. Thus, the potential loss due to fishing restrictions should be classified as MINOR but not MAJOR.

The DEIS would include information on several other topics relevant to the commercial fishing industry. It should discuss the impact of all spills on potential fishery resources such as the Alaska halibut, salmon, and herring. With the recent decline in crab stocks, fishermen may expect their harvests to increase these species. There is no discussion on the impact of all spills on commercial fishing for salmon. This section could be affected through restrictions to limit movement or through restrictions to ensure the safety of crew members. It is essential to ensure the safety of the commercial fishing industry. The ADF&G restrictions for the industry provide 25 to 50 million a year to the state’s economy (Bering Sea Cooperative Management Plan, Revised Draft EIS). The DEIS should discuss the potential for taking of fish and herring caused by direct exposure to oil in the water column or by consuming contaminated prey. The only mention of fish taking is during actual harvest of crab and haddock.

The DEIS provides (p. IV-8-89) an example of catch loss due to fishing restrictions that-infused pelagics or groundfish. An annual loss of 400,000 lb of red king crab, 200,000 lb of snow crab, 100,000 lb of haddock, and 100,000 lb of herring is estimated in a worst-case scenario. The potential loss of crab harvest losses alone could be over $1.5 million per year. Marine life can be substantially in a competitive fishing area. Thus, the potential loss due to fishing restrictions should be classified as MINOR but not MAJOR.

In summary, the DEIS describes the probability of an oil spill reaching a particular location of the crab fishing grounds. Because crab boats are unaware of incoming ice, 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.

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The DEIS should discuss the impact of oil on groundfish stocks in relation to migration patterns. Most groundfish species migrate south during early spring for spawning, then migrate offshore during fall. Because a large portion of each Groundfish stock migrates transversely through the south Alaska Basin and the St. George Basin, the risk of exposure of a major portion of each stock to oil spills is high.

The DEIS should include information on several other topics relevant to the commercial fishing industry. It should discuss the impact of all spills on potential fishery resources such as the Alaska halibut, salmon, and herring. With the recent decline in crab stocks, fishermen may expect their harvests to increase these species. There is no discussion on the impact of all spills on commercial fishing for salmon. This section could be affected through restrictions to limit movement or through restrictions to ensure the safety of crew members. It is essential to ensure the safety of the commercial fishing industry. The ADF&G restrictions for the industry provide 25 to 50 million a year to the state’s economy (Bering Sea Cooperative Management Plan, Revised Draft EIS). The DEIS should discuss the potential for taking of fish and herring caused by direct exposure to oil in the water column or by consuming contaminated prey. The only mention of fish taking is during actual harvest of crab and haddock.

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CHAPTER 3 AFFECTED ENVIRONMENT

The description of the environmental setting provides the necessary basic 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.

1. Physical Oceanography and Meteorology

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 area should be sufficient in detail to interpret the oil spill risk model, to estimate the rates of transporting oil, and to describe possible meteorological effects on day-to-day expiration and production activities. The discussion of environmental conditions is a two-paragraph summary of a paper presented by Crenshaw (1985). Lack of:

1. A discussion of storm intensity, storm frequency, and typical storm tracks.
2. A discussion of fog and ice conditions which could inhibit cleanup activities and affect shipping through Dutchak Pass and in and out of Balchin Bay.

Detailed and more recent studies than those referenced in the DEIS have been done by the ROAAM-FEMCO Laboratory. These studies could be incorporated into the DEIS analysis with relatively little effort. They are identified in the reference section.

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 Balchin 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 area. Ice cover is assumed for all wintry estimations of oil spill trajectories.

The frequency of ice cover and its characteristics (i.e., breakup and drifting or solid) are not discussed. According to Graph 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.

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The two sources of energy which will disperse discharged drilling mud and cuttings are tides and wind-induced waves. The discussion does not include wind-induced waves, and tides are only briefly mentioned.

1.3 Fishery Resources

In general, the DEIS provided an adequate life-history description of most economically and ecologically important fishes in the lease area.

The DEIS should provide a "review of how fishes interact with other organisms and how they respond to seasonal changes in the environment. A discussion of typical diurnal, seasonal, and year-to-year patterns needs to discuss the importance of interaction between [fish species in the area...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...[measures] 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 COCE for the area (Jones & Stokes 1984).

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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 comparisons 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 run in recent years. Sockeye production in the Chignik River system should not be labeled as small. In 1984, a record 5 million sockeye returned to the system at a value of over $220 million to the fishermen. Major stocks involved in the Chignik Island and Stepovak area fisheries, although major stocks involved in the Chignik Island and Stepovak area fisheries, although

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.

The FEIS should include information from two SOA-funded studies conducted in the 1980s that focus on the utilization and dynamics in Port Moller. These studies should provide information on fishery utilization by forage and juvenile fishes. (Please see the reference section of this report for the titles and EFP numbers for these studies).
Since the proposed plan is to run an oil pipeline through Port Moller and Hermaness Bay and across the Alaska Peninsula to Bala Bay, a section of the chapter describing the affected environment should be devoted to describing the community functions in these and other habitats. Additionally, the DEIS does not mention whether fish exist in streams along the proposed transportation corridor between Hermaness Bay and Bala Bay.

3.3 Invertebrates

Although data of commercially important invertebrate species are noted, the impact of these and other invertebrate organisms to the fish community 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 all oil spills, other water quality problems, or habitat loss on the marine environment.

In order to evaluate the significance of all oil spills or other major environmental perturbations on key invertebrate species, detailed information must be available on whether the populations are concentrated in or are a particular species for habitats during their life history. This discussion is adequate in some cases and essential in others. In these cases, the information needed to evaluate the risk, magnitude, and significance of potential adverse effects.

Insufficient information is given on the habitat types and invertebrate resources of Port Moller and Bala Bay to determine the effect of pipeline construction and shore facilities on these resources. The necessary information of Port Moller is particularly needed in the areas of groundfish and shorebirds, who primarily depend on invertebrates and small fish for food.

Several concern are noted in the discussion of pelagic invertebrates (p. 153, 155). The lack of data is in part due to the role of pelagic invertebrates in the complex food web. This information is given on to key species and their susceptibilities to oil spills in, whether they are concentrated in the upper water column layer. In general, when invertebrates are not sufficiently discussed, it is assumed that they have either a low key role in ecosystem function or no risk of adverse effects. Amphipods and euphausids are the most important food items for what?

3.4 Marine Mammals

A critical habitat section similar to that presented for birds should be added to the marine mammals. This should include areas such as at network Laggs and Port Moller at gray-white animals are present as well as indicating the gray-white spring feeding routes. The importance of the Bering Sea as a summer feeding area for many species, and the fact that many humpbacks obtain nearly all of their yearly food during summer, should be more clearly brought out in this section.

5.0 Commercial Fisheries

Although the DEIS adequately describes subsistence harvest in the southeastern Bering Sea, it does not mention subsistence activities that occur within the lease sale area. Specifying harvest in the lease sale area and provides numerous jobs for land residents. Specifying harvests should be described.

3.5 Water Quality

It is not clear whether the broad generalizations in the DEIS regarding regional water quality are appropriate for Port Moller, Hermaness Bay, Bala Bay, the Bering Sea, and the rest of Alaska. Since these water bodies are located in, or parallel the Inupiaq-maintained pipeline facilities, construction and operation of the pipeline and transportation could affect the water quality. Additional information in this chapter, however, is inadequate to conduct a screening-level assessment of the potential for water quality problems.

Additionally, data exist that more precisely describe the water quality conditions in the lease sale area. The data presented in the DEIS are general for British Bay and may or may not match conditions in the project area. With minimum effort, the DEIS could be used to develop a more appropriate description of water quality in the project area.

The potential of commercial harvests for kelp, sea cucumbers, and other marine plants and animals is not mentioned. Fisheries for these species presently occur or have occurred in the past in similar areas. Resource assessment cruise data collected by National Marine Fisheries Service should be used to assess the potential resources.

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 Bala 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 Bala Bay.

5.0 Territorial Resources

An information is given on territorial resources other than known oil and gas fields along the proposed pipeline corridor from Port Moller to Bala Bay. An adequate screening-level analysis of the potential for adverse impacts due to 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. 6-31-32), it does not indicate the nature or the information or process used in making the selection. For example, which other potential corridors were evaluated and why this corridor was selected.

3.7 Water Quality

It is not clear whether the broad generalizations in the DEIS regarding regional water quality are appropriate for Port Moller, Hermaness Bay, Bala Bay, the Bering Sea, and the rest of Alaska. Since these water bodies are located in, or parallel the Inupiaq-maintained pipeline facilities, construction and operation of the pipeline and transportation could affect the water quality. Additional information in this chapter, however, is inadequate to conduct a screening-level assessment of the potential for water quality problems.

Additionally, data exist that more precisely describe the water quality conditions in the lease sale area. The data presented in the DEIS are general for British Bay and may or may not match conditions in the project area. With minimum effort, the DEIS 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 difference in their functional impacts is needed. In practice, the DEIS reveals only two alternatives. According to Chapter 1, Alternative IV is distinguishable. Review of the DEIS reveals that environmentally important issues are really only two alternatives. According to Chapter 1, Alternative IV the Ashland Petroleum Refinery results...the DEIS should clarify the difference between these two alternatives.

Chapter 1 pp. 1-3-4 and 7 states that USFWS requested a deferral of batches less than 50 m in depth and that these options were deleted from the table. This conflicts with the description of Alternative I (the proposed action) in Chapter II, in which depths are used in range from 20-100 ft (p. 1-3-4).

There are inconsistencies with the soil and gas resource estimates. The values given in Table IV-A-4 are incompatible with the numbers shown in Table II-1. The values in Table II-1 and Table IV-A-4 are inconsistent with the estimates presented in the Federal Offshore Statistic, (September 1980). The difference in oil production (shown in Table IV-A-4 for Alternative IV) purportedly results in lower risk of oil or more gas of more than 1,000 bbl but change in risk of one or more bbls of more than 100,000 bbls. These incompatibilities should be corrected.

There is also confusion and a lack of distinction between Alternative I (the study and Alternative III (the study, the fault states that Alternative II (the study represents a combination of the lease sale in the current 5-year lease calculations, but in reality the opportunity to "eventually produce" oil and gas would be "limited" as the regulations were in perpetuity. This latter interpretation is also shown in Chapter 1. If, however, the sale were to be reconsidered during the next 5-year lease schedule, then Alternative II (the study is effectively no different than Alternative III (the study) which recomposes the same sale for 5 years. If the sale is to be permanently canceled under Alternative IV, the description should be reconsidered and there should be a new clarification in place to clarify the difference between these two alternatives.

Finally, and perhaps most important, it should be stressed that the introduction to Chapter II that the proposed alternative described in the DEIS is not a worst-case scenario. The proposed action is a mean-case development scenario for primary recovery operations only. No mention of potential development scenario would involve abandonment of 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 which are not enforceable (NTIA) and those which are enforceable but not enforced (ITLA), particularly the discussion of specific ITLA. As a result, the Potential Mitigation 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 (NTIA). Second, the "Supplemental" 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 measures. Third, much of the "purpose" material would be better placed in the accompanying descriptive portions ("purpose") on p. II-C-5, for example. Fourth, ITLA on bird and marine protection and on endangered species (p. II-C-7 through 10) are particularly redundant and confusing. For example, there are two ITLA 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 the connotation of "alteration" or "reposition." Thus, a mitigation measure should alter 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 so partial compensation for adverse effects on another resource.

Greater care must be taken in the intermingling of words such as "would" and "could" because they are not equivalent. For example, because regulations would help prevent discharges, it does not necessarily follow that overall impact would be minor (p. IV-B-315 or is likely to be minor (p. IV-B-32). This follows only if methods are established to measure implementation of the controls. Assumptions of mitigating actions should be carefully stated with the impact judgments to prevent these contingent requirements from being overlooked for the need for it to be fulfilled or impact summaries.

Stipulation No. 3 Protection of Biological Resources (p. II-C-3) outlines the...is of environmental impact to tanker transport is unverified. We are not aware of data on spill rates for offshore loading of tankers at platforms. IMO annexes (p. IV-A-3) 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 offsite testing to "in offshore facilities with limited access to the area...a strict testing during summer. Although it may result in higher costs to the, the environmentally preferred option would be either surveys. It would be incorrect to argue that winter weather conditions preclude testing operations but not drilling, production, or transport activities.
CHAPTER 5 TECHNICAL CORRECTIONS & QUESTIONS

5.1 Alternatives Comparison
p. III-B-4 Alternative 1: 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-13).

p. III-C-11 Information on the Aleutian Canada Goose
Avachtada Island and Unimak Island should be mentioned as possible nesting and staging areas for the Aleutian Canada Goose (as noted in Graphite E).

p. III-C-15 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. IV-C-16 Alternative IV - Alaska Peninsula Deferral

Details 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-4 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 Chumook Salmon
The fourth sentence in the last paragraph is confusing. Is it meant that juvenile chumook from Bering Sea rivers 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 Saumon Louse
Adult saumon louse bury themselves in sand during the right side. Results of the 1984 NOAA-funded study are pertinent to the discussion of sand louse (see the reference section of this report).

p. III-B-11 Yellowfin Sole
What is the rank of yellowfin sole among demersal fish? Again, results of the 1984 NOAA-funded study are pertinent to the discussion of yellowfin sole.

p. III-B-12 Pacific Halibut
Is the Pacific halibut population presently stable?

5.2.2 Invertebrates
p. III-B-15 Epifauna/Rad King Crab

The introductory paragraph under "Epifauna" notes that echinoderms account for more than 50 percent of the epibenthic biomass. The paragraph then notes that commercially important crab species are dominant epifauna. The first paragraph of "Rad King Crab" notes that king crab are the dominant component of the epibenthic 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 upwelling and therefore at risk from oil spills.

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 which some licensees of stating that "Most of the lease area lies..." and " Virtually all the remainder..."
Footnote "a" is not consistent with the numerical data presented in the table. If mures and curled pulleys are included in the analysis, the table should reflect this.

Table II-1:
First word of title should be "Waterfall," not "Waterfall."
p. III-C-2 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 rounds 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., 50,565 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 harvest might be.

p. III-C-16 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, markel, etc. are not considered flatfish as suggested in the DEIS. Also, sardines and anchovies are not harvested in the Bering Sea.

p. II-D-7 Air & Water Quality

p. II-D-1

Should it be assumed that marine production at the sediment-water interface of the St. George Basin was extrapolated to the North Aleutian Basin?

p. III-D-2 Air Quality

The DEIS should note that a Class I area (Chinook Wilderness) is about 100 km from Bullion Bay in the Shumagin Islands.

Table III-9 State of Alaska Ambient Air Quality Standards

Footnote "d" should be deleted since the Federal standard is also specific for ozone (1987 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 mud during exploration are not consistent with the text on p. IV-A-5. Also, data are given for quantity of drilling mud discharges during production. Reference should be made to the table to sanitary waste discharges during exploration. Other exploration discharges are not discussed, such as cuttings, deck discharges, etc. These discharges should be included.

Even if values are not readily available, some reference should be made to the table to these discharges, especially since oil spills could be related to these discharges. Biodegraded discharges are potentially significant sources of adverse environmental impact. A footnote should be included indicating 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 p. 142 that assumes spill at a single point in time. What happens in the case of a worst case, 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-A-5 Table IV-13

The reference source is not easily found in the literature citation section. Only someone who is familiar with the references would know where to find the original data.

p. IV-B-6 Oil Spill Effects

In the middle of the third paragraph, the reference to labeled stages is the "most sensitive of these early developmental life stages." Since herring are not herring, the use of "these" is either an error or it indicates missing text material.
p. IV-B-22 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 lobster population. It is noted that larger spawning stocks occur near Tikish and at Port Frederik. On page IV-B-21, Port Moller is noted as one of the three key spawning areas. For proper balance, this fact should also be noted on p. IV-B-22.

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.

p. 5.3.2 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 other.

p. IV-B-47 Indirect Oil Spill Effects
Polar bears may also occur in local as well as sublethal concentrations.

p. IV-B-47 Indirect Oil Spill Effects
It should not be assumed that all slicks will cover small localized areas. Slick size depends on spill volume, current, and other factors. Even a spill of 5,000 bbl is said to have covered 100 sq km (following page).

p. IV-B-48 Site-Specific Effects
See other groups up to 1,000 animals have been seen in the area. The average number/9 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 not recovered from the 1972-74 reduction (p. IV-B-50).

p. IV-B-51 Site-Specific Oil Disturbances
The level, frequency, and number of seismic disturbances should be described. The fact that none may carry over 100 kilometers (p. IV-B-121) should also be noted.
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 exile is insufficient to affect pinnipeds (p. IV-B-50); disturbance effects should not be assumed "likely to be minor" unless assurance code-prevention can be established.

p. IV-B-54 Cumulative Effects
Some wildlife 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 grey whale "rarely by engulfing several square miles of sediment at once. There is, therefore, potential for not only ingestion of contaminated food but also tar balls.

p. IV-B-51 Grey Whales
The test refers to the St. George Basin rather than the North Aleutian Basin. This is obviously an error.

p. IV-B-52 Grey Whales
The last sentence of paragraph 5 appears in conflict with most of the same paragraph. A variety of sounds, not just "...only the loudest..." appeared to excite migration.

p. IV-B-57 Bowhead and Right Whales
The distance considered to be "near the site" should be defined. The following pages indicate distance can occur at 5 km and more.

p. IV-B-58 Bowhead and Right Whales
Exposure 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-90 Direct and Indirect Effects
There appears to be no basis for the statement that "It is not reasonable to expect that exposure would occur 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-55 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-58 Effects on Commercial Fishing Industry
Although the intentions of the Commercial Fisheries Group of Alaska are good, communication of critical problems to fishermen can be especially difficult during the fishing season. This mitigation measure remains unproven.

p. IV-B-90 Trawl Gear Damage
The DES should mention the occurrence 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 disturbances 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 DES regarding the effect of an oil spill on fishing operations given that a spill of 1,000 bbl will occur? Given the spill will occur near a major fishery, it seems reasonable that the potential effect could be great.

p. IV-B-95 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-12 referenced to is actually Table IV-17.

p. IV-C-4 Endangered Species
Island Lagoons should be mentioned as a gray whale summer use area.

5.3.7 Other Issues
p. IV-F-2 Deliberate Discharges
Drilling fluids contain a number of additives, including blowouts and metal-containing compounds. The impact of such additives on water quality should be described. Remanent of drilling muds may also result in short-term turbidity subsequent to initial deposition.
p. IV-F-4 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 remain unchanged (Chapter I)?

5.3.7.2 Air Quality

Table IV-18

Table IV-18 and related text discussion should be revised to reflect the distance offshore of the closest blowout rather than the 5 km distance shown. The description of Lesser Salt 27 (p. IV-B-1) indicates that the closest blowout is 18 km offshore. At this distance, the air quality criteria exemption level for CO would be exceeded (Chapter I), while the exemption level for other pollutants would be 0.15 ppm.

p. IV-F-4 Normal Offshore Operations

The Department of Interior’s air quality analysis exemption procedure should be explained and related to these federal and state air quality permit requirements and procedures. The 1994 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 Acre area should be considered for future ESIs.

An annually updated emission inventory of OCS sources should be kept in a cumulative modeling and more efficient and equitable development of mitigation measures for State-controlled and NOAA-controlled sources.

It is not clear whether emissions present in Tables IV-20 & 21 are controlled or uncontrolled. If Table IV-21 represents controlled emissions, TSP would only qualify for PSD review in the discussion at the mid-level of p.IV-F-4, because it exceeds the PSD significance level of 25 tons per year.

We suggest using English units (metric units may be included in parenthesis) in text and in all air quality tables, to 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 [NOX] would be exceeded because drilling sites would be centered with a location more than 1 km offshore” is misleading. Footnote 2 to Table IV-18 indicates that the emission estimates are for a single platform with 13 wells. The emission estimates in Table IV-18 indicates that OCS exemption levels for NOx would be exceeded with platforms up to 56.8 and 68.6 km offshore during average and peak production, respectively. During average and peak production, the maximum emissions for NOx 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 exploration facilities?

Page IV-F-4 states that burning a gas blowout would “... very slightly increase emissions — relative to quantities in other oil and gas industry emissions — or less?” other pollutants (Table IV-21). This document may be misleading, and should perhaps contain additional discussion in Table IV-21 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 oil 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 solids?

p. IV-C-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 sections of this e on oil spill to birds.

p. IV-C-1 Fisheries Resources

The notion that unavoidable oil spill effects would be substantially reduced if oil spill contingency plans were carried out effectively and cleaning techniques were successful is misleading. In view of the fact that containment and cleaning effectiveness is completely dependent on favorable weather conditions. Favorable weather conditions are the exception rather than the rule for this basin.

NOAA funded Studies
The Study of Inshore Use by Fish Species on the North Side of the Alaska Peninsula. EFP No. WASC-84-0023.
An Environmental Characterization of the North Alaska Peninsula Coastal Zone. EFP No. WASC-84-0023.

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 8%); all of the area inside Bristol Bay was eliminated, and a minimum buffer of 18 kilometers (12 nautical miles) was provided between the lease area and the Alaska Peninsula. The one deferred (Alternative 7) remaining after the reduction deferred blocks within 25 miles of the Alaska Peninsula and 10 miles of Unimak Pass. This deferral was based largely on scoping recommendations provided by the National Marine Fisheries Service (NMFS), the United States Fish and Wildlife Service (FWS), the Natural Resources Defense Council, the Bristol Bay Coastal Resource Service Area (CBRA) Board, and the Aleutians East CBRA Board. Therefore, the Corps 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. 1.D.3.). The commenter 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 minimal 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 15 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 PWS 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 1% of the eastern part of the alternative area containing water depths between 40 and 70 meters. Alternative IV generally complies with the PWS request for an alternative. The PWS 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-6. 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 undertakes effects by “averaging” effects of all the various activities associated with development, or by “averaging” over the entire area. 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 15-8.

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.(3)) 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)). The 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 seen 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 areas (Sec. IVA. IV.B.1.a.(6)) 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 PWS 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 Bellingham 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 PWS 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 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 decision making. 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 facts, and has drawn from them a realistic assessment of the degree of effect considered possible. A major thrust of the analysis is to enlarge, by a conservative approach to insure that the outcomes are fully evaluated. The judgment of the analysis is to emphasize regional and local effects, which are gauged by an objective system (defined in advance) on a scale consistent with spillage. When the EIS receives a substitute analysis for a potential effect which can be rigorously, consistently, and objectively stipulated, 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 sources 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 now 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, major offshore 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 armor 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-13). 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 mariner-pipeline environments are much milder. 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 the seasonal extremes at almost any single land pipeline site. However, in any legitimate comparison of sea-bottom environment with land environment, we would have to consider far harsher than that of the North Sea or British Columbia because of the tremendous tidal currents in the latter.

The MMS contractors have attempted to obtain equivalent North Sea oil-spill statistics but were unsuccessful if the data can be located or compiled. As commented on in the Report, the MMS would still be interested in the suggested comments.

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 commenter's consolidated model is also included. This may explain the commenter's confusion regarding how the table was constructed.

The report concluded in this case, "boundless" 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 predict the trend is decreased spillage noted for these categories in Section IV.A.3.b. Spillage over earlier years must be protected from pre-1973 spill rates (2.05 spills of 3,000 barrels in 1976) to obtain a reliable prediction of major effects of the various activities associated with 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 commenter's consolidated model is also included. This may explain the commenter's confusion regarding how the table was constructed.

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An example from Section IV.B.1.b. (Pathways Resources) of the EIS is used to explain how the occurrence conclusion was derived. For salmon, the most likely effects from basaltic activities, discharges, and oil spills would be negligible, minor, and minor, respectively. The bottom conclusion is that the aggregate effects of baseline activities on salmon are expected to be minor. In the event that an oil spill occurred near shore areas (i.e., Port Valdez) when all benthic predators were present, the aggregate effect could result (i.e., from oil spills) which, in conjunction with negligible baseline effects and minor discharge effects, would result in a moderate over-all 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 conclude that the overall effect would be minor. However, if a major oil spill occurred and contaminated the Port Valdez area when ovigerous females, larvae, and juvenile red king crab were present, a major effect on

Response 15-16

Spills within Utinak Pass are included in the oil-spill-risk analysis (Section 3). The comment on spills south of Utinak Pass is addressed in Response 4-14.

Response 15-17

The analysis 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 of the predator population's viability 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 discussion of bottoming 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/transportation, drilling discharges, etc.) and then examines effects of these activities in the aggregate against a consistently applied scale. That scale is the set of definitions provided in Table II-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 commenter 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 high resource, the overall effect is considered major. 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).
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 (Chaps. 7 and 9) for regional populations. The EIS analysis considers localized effects and related them to the effect on the regional population. This does not constitute an averaging of effects.

Response 15-10

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 high- vs. low-risk probabilities may reveal biological targets that have extremely low or negligible stake of contact by a spill. This review would then assist the analyst in eliminating these areas, while focusing on a better Sharper focus of events that have a higher possibility of occurrence. This allows the user to answer the question, "What effects are expected from leasing in the Sale 92 area?" The NMS 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 resources"). 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 are also presented, as well as the circumstances or conditions that would need to be in place for their occurrence to occur. Therefore, the EIS presents a range of potential effects. This actually enhances the ability of the decisionmaker to public and their own judgments regarding the acceptability of risks to biological targets.

Response 15-20

The EIS has been amended to include a more in-depth analysis of pipelines and port facilities. The effects of the development activities have been assessed for fisheries resources (Sec. IV.B.4.a.(3)), 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, number of leases, and other details. Scrutiny in a screening 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 CEF 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 concise 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 NMS. The EIS analysis is required to assume that all existing laws and regulations are followed. The EPA is required to conduct ODCE and WDEE 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 15-26

The assumption that production drilling would result in the discharge and deposition of substantial quantities of drilling mud is unfounded, since excessive quantities of mud solids used and discharged during production drilling, the MMS assumes that mud solids would be drilled from a single platform. During the drilling process, it is assumed that about 11 percent of the 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 these 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 (3,200-4,000 tons). Therefore, bioaccumulation of heavy metals would be less of a problem during production drilling, exploration, which the commenter states is a non-problem.

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, non-depositional shelf (Thorne, 1969); 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 15-27

MUDS 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 industry formation waters1 appear to harm 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 Clime (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 OGCSE 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 assure 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 phase 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 8-1. Under the proposed action, only two platforms are anticipated; the effects of platform discharges would contemplate
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 will not have significant 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.(a) (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 particulate. Secondary development that might emit particulate matter would be comparatively minuscule.

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 atmospheric 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 assumed water 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 inappropriate to classify potential effects on air quality as minor.

Response 15-33
If an LNG plant and tanking 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 4-8. 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 is also 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 ecological 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 15-58

Exposure times have been added to Table IV-13. This table, summarized from Thorstenson and Thorstenson (1982), presents information from various sources (some, but not all, of which occur specifically in the lease sale area) for each species group to give a generalized range of LC50 values. It is acknowledged that great variation in sensitivity 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 LC50 values to illustrate what effects might be expected given various situations in the marine environment. The LC50 values are not used as threshold values to attempt to predict adverse effects.

Response 15-59

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 15-60

The text has been expanded to address this concern (see Sec. IV.B.1.a.(1) in the FEIS).

Response 15-61

The text has been expanded to address this concern (see Sec. IV.B.1.a.(1) in the FEIS).

Response 15-62

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 15-63

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

Response 15-64

This concern is addressed in Response 15-19.

Response 15-65

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 risk from the proposal. Therefore, no significant change in risk to these land segments is identified in Tables 0-10 and 0-16 of Appendix G.

Response 15-66

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 1, and the risk would still be low.

The commenter 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 commenter argued against this approach (refer to Comment and Response 15-18). The NMS agrees that probability does not equate with level of effect.

Response 15-67

"Major effect" refers to an analytical term defined in Table 5-2 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.(1). 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 Belkik Bay and all is assumed to be released from a grounded tanker. In Port Moller, a 7,500-barrel pipeline release is de-emphasized, 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.
Definitions describing effects on biological resources are designed to be flexible and allow a large degree of flexibility when assessing effects on a particular population. Each analysis must address the effects of each species of 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 WSC does not agree that a different set of definitions is absolutely necessary for each of the two groups.

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-km² area, where the assumed spill spread may be 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, 20-30 otters. Thus, the estimate of 40 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, see Response 5-13.

The EIS emphasizes floating oil slicks when discussing effects on marine mammals, because floating slicks are more hazardous to marine mammals than dissipated hydrocarbon in the water column or tar balls. A discussion of the fate and behavior of spilled oil is presented in Section IV.A.3.2. 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 walruses) are discussed in Sections IV.B.1.a.(3) and IV.B.1.a.(4) of the FEIS.

The text correctly states that "The whales came as close as 5 km to the platform, some beaked whales that were in the area. The direction swimming characteristics were observed at 1.6 and 0.64 kilometers. The tolerance mentioned applies to the general population trend and not to the experiments conducted by Bolt, Barnes, and Newman. A thorough reading of Section IV.B.1.d. of the DEIS suggests 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 atgun experiments, as stated in the text.

The text does not state that most nonendangered cetaceans eat copepods, 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.

This concern is addressed in Response 5-10.

OCS activities would not have a major effect on right whales because the majority of the population historically used the Gulf of Alaska. Most of the current sightings (from 1925 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 Alaskan Basin and also interacting with OCS activities. Since the North Pacific right whale population may already be biologically extinct (Bray and Dubilier, 1981), the effects of an adverse interaction between right whales and OCS activities in the North Alaskan Basin may not affect the regional population, because the few right whales in the North Alaskan Basin might not interact with right whales in other areas.

The legend in Graphic 4 indicates that the shaded area is the "most probable occurrence of humpback and fin whales." The text (see III.B.4.A. of the FEIS) has been amended to indicate the frequency 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.
The 19ES does not agree with the claim that baleen whales feed only during the summer. Recent data (Jones et al., 1984; Thompson, 1986) indicates that baleen 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.

The seasonal spawning-foraging migrations of a number of groundfish species of the eastern Bering Sea—halibut, yellowfin sole, pollock, and 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 with the water-soluble fractions of an oil spill would be low. Considering the extent of the oil spill compared to the entire area over which them 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.8.I.c.3(c) of the EIS concludes that whales are subject to little hazard from offshore oil and gas operations.

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 small 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 small fishery, and Section IV.B.I.b.3 assesses the potential effects of the proposed action. Commercial fisheries for penaeid 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 salmon caught and benefits to the Alaskan economy are growing. Given the expected minimal loss of immature and/or adult salmon results from an oil spill or spills, perhaps at most a few hundred immature 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.

Based on available information from Effects of Petroleum on Arctic and Subarctic Marine Environments and Organisms, Vol. I, "Nature and Fate of Petroleum" (2) by Donald E. Hallock, 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 EIS 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 1% of the spilled oil would evaporate and 9% would have entered the water column within 24 hours of the spill. By 10 days, when partitioning is almost complete, 1% would have evaporated, 5% would remain in the slick, and 2% would be dispersed in the water column. At this point (30 days) almost all of the volatile components, including many of the toxic components, would have evaporated. In fact, most of the volatile components would be gone from the slick and from the water column within 4 days (100 hrs). Alternately, any volatile, or nearly, the spilled oil would form a stable water-in-oil emulsion (svis) within 46 hrs, at which point any further partitioning would be dramatically decreased.

It would seem then that residual oil would remain in the water column, where they might contact contact crabs for up to 10 days.

The text (Sec. IV.B.I.a.2 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 fishing is not competitive with the above-mentioned fishery, although it would be affected by closure of an area 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 fishery species in the limited area distribution of the 1 projected oil spill of 1,000 barrels or greater could be assessed. 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 assumption 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 QCS areas would have little effect on the fisheries adjacent to the Alaska Peninsula or inner Bristol Bay. The distance of other QCS 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 Balso 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 Balso Bay; rather, the facility is tentatively assumed only for the purpose of analysis. Any use of Balso 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 Balso 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 Balso Bay would serve no analytical purposes. In the absence of terminal-siting information, it is assumed that a port spill could contact any resource in the vicinity of Balso 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.3.1.). The proposed lease sale area and North Atuelian 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 reuspension, water-column dispersion of drilling mud and drill cuttings is of very minor concern in this EIS and does not merit further discussion. The EIS analysis assumes that all site-specific guidelines will be followed. These regulations include Ocean Discharge Criteria (60 CFR Section 125.10 et seq.; 45 FR 65962 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 Pollution Discharge Elimination System (NPDES) permit. Prior to issuing such a permit, the EPA, under the Clean Water Act (NPDES permits), may require the Lease Plan to 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 15-63
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 result 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.(3) of the FEIS) to include information on run size (catch and escape) 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.(3) 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.(3)), 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 Brem- demm Bay and Balboa Bay has been incorporated into the fisheries resources description (Sec. III.B.1.) and the analysis (Sec. IV.B.1.a.3.).

Response 15-64d
This concern is addressed in Response 15-62.

Response 15-64h
Pipeline construction would temporarily disturb about 500 acres. Based on experience in other climates, recommissioning tends to be rapid. Likewise, shore facilities at an oil terminal would require 25-30 hectares and an LPG plant about 80 hectares) tend to have a minimal effect on marine habitat 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 Holler 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 15-61.

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 15-6a

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 15-6b

The potential for commercial harvests for shrimp, smiall blue and brown king crab, and Alaska surf clams 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 on the proposed action on related species also would apply to these species.

Existing commercial fisheries for these species are either undeveloped or very limited. For example, the king 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 Japanese and in several Aleutian Island bays by the U.S. N., no longer support a commercial effort.

As a result of these factors, it is unlikely that the establishment of a commercial lease sale for these species will cause any significant changes to the fishery. However, some areas of the lease sale area may become available for other commercial species discovered in the future.

Response 15-70

Section IV.B.1.h.1. of the FEIS includes a discussion of the commercial-fisheries resources of Baja California, on the southern side of the Alaska Peninsula.

Response 15-71

The analysis of the effects of a pipeline corridor on anadromous and freshwater fish has been incorporated in Section IV.B.1.a.11. of the FEIS. The Port Moller/Barbosa 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 Barbosa Bay), and an analysis of the effects of a transshipment terminal at Barbosa Bay on the water quality of Port Moller, Heronhead Bay, Barbosa Bay, and Portage Valley River and Foster Creek. The water-quality data cited by the EPA were requested by the MSG, 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 inputs. 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 Island bays by the U.S. N., no longer support a commercial effort.

The Bristol Bay ODA Board requested a 40-kilometer (25-mile) deferral along the Alaska Peninsula, and the Aleutians East ODA Board requested a 8-kilometer (5-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 (331,000 bbls).

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-4 (Sec. IV.A.2. of the FEIS) has been amended to correspond to the resource estimates (identified in Table II-1).

24

25
The mean conditional resource estimates for the proposal (364 MMBtu) has been revised since the publication of the Federal Offshore Statistics, September 1986.

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 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. 3V.J.J. 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.J. 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 NMS feels that an adequate distinction is made between stipulation and TIL's and that the existing format, which included stipulation or TIL followed by a purpose statement, does not need further specification. The MMS, specific notices issued to lessees under 30 CFR 250.30, are identified as such in Sections III.A.1.a. and b. The III's are discussed in Section II.C.1.b.(3).

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 protect provision 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 B), the NWFSP recommends reasonable and prudent alternatives to avoid likely jeopardy to the gray and right whales. The NWFSP recommends that the MMS permit deep-seismic (southern) geophysical surveys in the lease sale area only when the right whale is not present. The NWFSP also recommends that no seismic 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 these recommendations through appropriate mitigating measures, including III's and TIL's.
Mr. Thomas M. Boyd  
EIS Coordinator  
Environmental Assessment Section  
Minerals Management Service  
P.O. Box 10150  
Anchorage, AK 99510

February 12, 1985

F/MRC/MED

Dear Mr. Boyd:

Enclosed, as per your request, are our comments on the Draft Environmental Impact Statement - North Aleutian Basin Sale No. 2.

If you have any questions, or require additional information, please do not hesitate to contact me.

Sincerely yours,

Howard Graham, Ph.D.  
Director, National Marine Mammal Laboratory

Enclosure

For seals

Page 111 B-27

The Pribilof population of northern fur seals is currently estimated at 872,000 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 seals on Pribilof as "threatened" under ESA.

Page 114-46

16-1

Impact of all oil on fur seals seems "down-played". The Kennecott, Getty, and Mullister ref., contains ample information to conclude that oil has a serious effect on fur seals.

16-2

General

16-3

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.

Page 113 B-28 Bowhead whale:

For population estimate of approximately 4,000, cite Drakenberg, et al, 1985.


Ibid for winter distribution of bowhead whales, cite Druggeman 1982.


Page 113 B-31 (and IV 2-2, last paragraph)

First paragraph. Update gray whale population to 17,000 citing Hugh 1984 (which suggests 60% of the population enters the Bering Sea, thus increasing risk considerations)

Throughout this section references are made to "in press" papers. These papers are now published and should be cited as follows:


Please cite: Brahman and Nathaniel (1982). See enclosed article.

Paragraph 7 - decline till occurring in eastern Alaskan.
Paragraph 8 - No graph 3.
- No Bristol Bay fishing.
- The numbers 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 9 - Paragraph 6: No graph 11. 1 is now complete reference.

Overall - information presented is acceptable, however information could be updated with more recent citations (e.g. see item 1).

(Attached reprints have citations for)
Loughlin et al. 1984
Frost et al. 1982
Pitcher and Calhoun 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 DID states that see 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 McAllister (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 35-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.B.3.) 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.a.).

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. Garfield and St. John'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).
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 commenter 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 leasing 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.1) of this FEIS.

David G. Wright

Enclosures

cc: Director, NPS (NR-864) Boston, MA 22091
United States Department of the Interior
FISH AND WILDLIFE SERVICE
1811 E. TUDOR RD.
ANCHORAGE, ALASKA 99503

Regional Manager
Ninilchik Management Service
Alaska OCS Region
P.O. Box 10-1230
Anchorage, Alaska 99510

MAR 3 1985

Dear Mr. Power:

The U.S. Fish and Wildlife Service, Alaska Region, has reviewed the Draft Environmental Impact Statement North Slope Area, Rev. 0-91. 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 III-0-10. Information on Endangered Whales - There appear to be two similar X's where one would suffice.

17-2 Page III-25. Key, Important, and General Caribou Habitat Distribution - Text announcing the figure indicates that it shows the general distribution of caribou habitat in the whole Alaska Peninsula. However, the figure appears to show only habitat on peninsula refuge.

17-3 Page 196-3. Section 6. Title of the section implies that estimates of formation water production will be discussed. However, no such discussion is provided.

17-4 Table 19-3. 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,

[Signature]

Acting Regional Director

cc: Bay Frits, DOC

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. 111(1) of the FEIS).

Response 17-3
The text has been amended to provide a discussion of formation water estimates (see Sec. 111.11a.1(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.
Response 19-1

The effect of oil spills on onshore water quality was not raised as an issue in scoping for the proposed sale end, 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 (Lanfair 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 50 kilometers of onshore pipeline. Thus, it is very unlikely that a major onshore-pipeline spill would occur.

Copy to: Director, MMS, Boston (RS-664)
United States Department of the Interior
BUREAU OF MINES

ALASKA FIELD OPERATIONS CENTER
P.O. Box 130
Juneau, AK 99802
March 4, 1985

Minerals Management Service
Regional Director
P.O. Box 101199
Anchorage, Alaska 99510


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.

[Signature]
Donald F. Blasko
Chief, AFOS

January 24, 1985

Thomas Boyd
U.S. Department of the Interior
Minerals Management Service
Alaska OCS
Box 101199
Anchorage, Alaska 99510

Dear Mr. Boyd:

We have reviewed the Draft Environmental Impact Statement for the North Alaskan Basin Sale. We have no comments to offer.

Thank you for the opportunity to review this document.

Sincerely,

[Signature]
Burt H. Clifford
State Conservationist
February 6, 1985

Thomas M. Boyd
EIS Coordinator
Environmental Assessment Section
Minerals Management Service
P.O. Box 101159
Anchorage, AK 99510

RE: Draft Environmental Impact Statement (DEIS) for North Llewan 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 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 additional questions at this time, please contact Dean Stimson at T-2682, an FTS number.

Sincerely,

Robert Fink
Chief, Western Division
of Project Review
Appendix I of the EIS has been amended to address this concern.

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:

The section on liquefied Natural Gas imports on page 2-17 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
January 19, 1985

Mr. William Bettenberg, Director
Minerals Management Service
U.S. Department of the Interior
Noden, VA 22309

Dear Mr. Bettenberg:

Your recent letter requests comments from Oils Department on the draft environmental impact statement for Proposed Drilling Site and Gas Lease Area No. 92, North Atlanic Basin.

Regional Representatives of the Secretary coordinate departmental comments on environmental impact statements (prepared by other agencies) that affect only one region and that may involve more than one DOT administration.

Accordingly, your letter has been referred to Robert Hyer, DOT Regional Representative of the Secretary, Regions II, 410 Main Street, San Francisco, CA 94105. Thank you for the opportunity to comment.

Sincerely,

Eugene L. Lehr, Chief
Environmental Division
Office of Transportation Regulatory Affairs

March 8, 1985

Mr. Al Powers
Minerals Management Service
P.O. Box 19173
Anchorage, AK 99510

Dear Mr. Powers:

Opponents of leasing OCS lands in the North Atlanic 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 mean permission to produce. If they find no oil, their permission to drill doesn't automatically mean permission to produce... or automatically even mean a profit. Suppose they find gas?

At each level the costs increase, and the rewards are better known. More data will be collected when we need more data. If nothing is found the status will have been few.

I support carefully moving ahead with North Atlantic Basin #2 in December 1985, and careful consideration in the years ahead. But let's get started.

Sincerely,

Walter J. Hulse
March 7, 1985

Glen Tanko
E.I.S. Coordinator
Environmental Assessment Section
Minerals Management Service
P.O. Box 10119
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 impacts 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 reliability 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 all killing is allowed to occur there in 1985 as proposed in the Northern Aleutian Basin Sale #2.

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, strong tides, low 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 even human lives. There will be even greater obstacles to the moving and deployment of specialized equipment.

I do 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 the Bristol Bay - Northern Aleutian shelf areas will not be allowed to occur. Thank you.

Sincerely,

Richard B. Russell
Eagle/Unalaska Area Biologist

cc: Claudia Slater

Thomas K. Boyd
EIS Coordinator
Minerals Management Service
P.O. Box 10119
Anchorage, Alaska 99510

January 28, 1985

Dear Sir,

Thank you for your specific address for opinions on the North Aleutian Basin Sale #2 Draft Environmental Impact Statement. I am sending this to you.

Because of the present "glut" of oil on the world market, and consequent low price for petroleum raw material, the leasing of this area is not in the best interest of the United States. 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 decreased 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 none of their most serious concerns have been addressed, their reasons were good, are still relevant, and their requests should be followed.

Sincerely,

Florence A. Collins

Eagle/Unalaska Area Biologist
The Endangered Species Act. It also does not fully consider the likelihood of potential significance of disrupting or eliminating the gray whale's life cycle and its implications of the coupling stellar sea lion population decline. Predictions of possible impacts on that species, therefore, have already been done, the Commission recommends that the Minerals Management Service consult with the National Marine Fisheries Service for some potential interaction and impact assessments.

DEIS also notes the necessity to detect and mitigate potential unforeseen effects on an increase in habitat use, and the potential impacts associated with a lease sale. The Commission recommends that they be incorporated as part of the proposed action and other leasing alternatives as discussed below.

DEIS also should be modified to: (a) provide additional discussion and analysis concerning possible cumulative effects of the different lessors or lessees for the proposed activity. (b) describe the responsibilities of the Service's and describe the roles of the other responsible authorities, if any. (c) identify the coastal and non-coastal marine mammals and the scenarios under which they may be affected, and impacts on those marine mammals. (d) indicates that impacts on gray whales are significant and that impacts on gray whales, even if not identified, may occur. (e) indicate the potential significance of the northern for eel population and the status of recent surveys/estimates for listing of the species threatened by this section.
complete assessment of the nature and possible effects of the 3
proposed and alternative actions it should be expanded to describe
possible effects of this and other existing or planned
oil and gas related activities in the Beaufort Sea area. For
example, it should be noted that offshore development associated
with oil and gas exploration and development activities, such as
sea and seafloor exploration and development activities, may cause significant adverse effects on certain
140
mammals and other important marine species (e.g., for
seals, grey whales, sea birds, and certain stocks of
fish and shellfish) and that if such effects occur to these
species activities associated with the proposed sale could be much more
influential than those presented in the DSR, which are based on
the current population status and size of regional living marine
resources.

114
Here again we refer the reader to Table 3-1, which provides an analysis of possible effects of the proposed and alternative actions. The Table 3-1 includes separate entries for each of these specified activities. The Table should indicate that effects on all animals would be minor. For the
reasons noted below, impacts on northern fur seals and Steller sea
lions would be minimal. These species have been also noted above, but this summary
Table should be used to indicate the cumulative effects of this
and alternative activities in the region.

118
Finally, we refer to the last section of this chapter, which describes the role of the Minerals Management Service’s Alaska Environmental Studies Program 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.

120
Endangered Species Consultation: This section notes that the Minerals Management Service initiated consultations with the fish and wildlife agencies and the National Marine Fisheries
Service recently determined that this action is warranted
under the Endangered Species Act and that the results of those consultations is that a petition was submitted to the National
Marine Fisheries Service by the Federal, state, and local governments.
120
Endangered Species Consultation: This section notes that the Minerals Management Service initiated consultations with the fish and wildlife agencies and the National Marine Fisheries
Service recently determined that this action is warranted
under the Endangered Species Act and that the results of those consultations is that a petition was submitted to the National
Marine Fisheries Service by the Federal, state, and local governments.

122
Minerals Management Service's National Marine Fisheries Service to ensure that all necessary and appropriate
mitigation measures for protecting this species are identified.

122
This is the end of the discussion and the decision to proceed with the North Slope Basin for leasing does not mean that we have
reverted to the decision in 1995. The reason for reversing the decision is not, but
probably should be, identified at this point in the text.

124
These sections provide a potential mitigation measures. This
portion of the text identifies a number of potential
mitigation measures designed to reduce potential impacts on various resources
and the general orientation program and protection of biological resources. Such
measures would help reduce or avoid potential impacts on marine
habitats and the ecosystem of which they are a part. Therefore,
the Commission recommends that they be incorporated as part of the
proposed action.

126
In addition, one of the most important steps that can be
taken is to ensure that environmental resources are not adversely
affected in order to ensure that the lease sale (the Regional
Superintendent, Field Operations) has the environmental information
necessary to make informed decisions with respect to the
leasing process. The Commission recommends, for example, that an
additional Continental Shelf Land 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 licensing decisions and for the purpose of
specific actions and monitoring needs are also included in the
Biological opinion prepared by the National Marine Fisheries
Service for this sale and included in Appendix H.

128
The Minerals Management Service's Regional Environmental
Studies Program, which addresses these requirements, has
provided options for predicting, detecting and mitigating potential
environmental impacts. Management related activities, however, is not
identified as a potential mitigating measure here or anywhere in the DSR.
The Commission, therefore, recommends that this section of the
Regional Environmental Studies Program be expanded to include specific
mitigation measures, the post-lease real and monitoring
activities, and the general orientation program and protection of
biological resources. Among other things, the new section should identify the
Commission's role in ensuring that lease managers are able to detect
and mitigate possible unforeseen effects.
In part, would T...ensure that personnel understand the importance of evidence and non-harmful wildlife rescue. The contractor, with the help of the biologist, would be responsible for documenting the incident and the appropriate course of action. The biologist would consult with the Commission and appropriate authorities on the identification of the species and the proper course of action. As noted above, the Commission recommends that this potential mitigation measure be incorporated as part of the proposed action and other leasing alternatives.

28-15

The section also indicates that membership on the BIF would include representatives of the Minerals Management Service, the National Marine Fisheries Service, the FWS and Wildlife Service, and the Environmental Protection Agency and that representatives from other organizations would participate as a full member of the Bering Sea Biological Task Force.

28-16

This paragraph provides information on the potential risks and benefits of potential mitigation measures in place. The second sentence of the paragraph concludes that "mitigation measures potentially reduce noise and disturbance to marine mammals from minor to negligible." Since the section discusses only non-harmful and sea otters, the text "marine mammals are generally non-harmful and sea otters are likely to become the focus of the BIF." The introduction to this section should be expanded to indicate that these notices would be updated from time to time as needed.

28-17

This section also discusses the effectiveness of mitigation measures on bird and marine mammals, specifically on the status of special biological significance. As indicated above, the effectiveness of these directives would be better evaluated by the Second Sentence of the paragraph. The second sentence of the paragraph notes that the BIF is responsible for the implementation of the Environmental Studies Program in monitoring and improving available information on the demography, biology, and ecology of marine mammals. Such data should be identified and discussed in the section.

28-18

This provides a valuable and comprehensive index of the potential major
effects of the proposed and alternative actions. For reasons explained in the "effects" section of this Title 1, the Marine Mammal Protection Act is an appropriate
substitute. This section should be revised to indicate that effects on northern for
seas should be reviewed in light of the new information. Also for reasons noted below, the section of the Table entitled "Potential Spill Threatened Species" should be revised to indicate that effects on gray whales could be moderate and effects on right and
white whales could be negligible.

Page 28-19

This section describes the potential for spills to occur during and following the survey. It is
important to note that the information presented in this section is based on projections and should be revised to include the most current information available. The
potential for spills to occur during and following the survey is considered to be low, with a
rate of 1% expected for spills of less than 1,000 gallons. However, the potential for spills to
occur during and following the survey is considered to be moderate, with a rate of 5% expected for spills of less than 10,000 gallons.

Page 28-21

The section on "Potential Spill Threatened Species" should be revised to include the most current information available. The potential for spills to occur during and following the survey is considered to be low, with a rate of 1% expected for spills of less than 1,000 gallons. However, the potential for spills to occur during and following the survey is considered to be moderate, with a rate of 5% expected for spills of less than 10,000 gallons.

Page 28-23

This section provides information on potential spillovers of the survey. It is
important to note that the information presented in this section is based on projections and should be revised to include the most current information available. The potential for spillovers to occur during and following the survey is considered to be low, with a rate of 1% expected for spills of less than 1,000 gallons. However, the potential for spillovers to occur during and following the survey is considered to be moderate, with a rate of 5% expected for spills of less than 10,000 gallons.
generation could be required to recover from such effects and, therefore, statements in the "summary" and "conclusion," which indicate that the effects of oil spills on all pelagic would be minor, should be revised to indicate that effects on many bales for seals and smaller pelagic could range from minor to major.

Page IV-9-17, Oil Spill Evidence: This paragraph cites available information suggesting that pelagic and sea otters are not likely to avoid oil spills at all situations and that, as a result, an unknown number of sea otters were killed. A few to several thousand individuals could be contaminated. Additionally, the active Pribilof Island population of northern fur seals, including breeding females, were in and migrated throughout the oil spill area (28-30). Therefore, some of the effects, such as the death of sea otters, may be difficult to estimate, and the effects on the fur seal and sea lion populations could result in the loss of several hundred thousand or more individuals. Therefore, something like the words "sealing areas" should be inserted between the words "seals" and "sea lion" in the fourth sentence of the paragraph.

Page IV-9-17, third complete paragraph: The reference to Figure 10 in the last line of the paragraph should be changed to Figure 12.

Page IV-9-28, first complete paragraph: The first sentence of this paragraph notes that several thousand seal and other otters could be exposed to oil spills; fewer animals (probably in the hundreds or thousands) are likely to come in direct contact with oil spills. A few to several thousand individuals could be killed. The possibility that some of these individuals could be killed by nonspecific means (e.g., injuries or disease) is also possible. Therefore, something like the words "injuries and deaths" should be added to the end of the paragraph, since this section addresses only oil spills and sea otters.

Page IV-9-28, second complete paragraph: The fifth and sixth sentences of this paragraph should be modified from "If all otters were killed" to "A minimum of 400 to 700 otters" assuming a density of 4 to 7 otters per square kilometer. As noted on page 11-28-10, the number of oil spills that occurred near Alaska's oil spill

Page IV-9-28, third complete paragraph: Therefore, a new sentence should be added following the sixth sentence of this paragraph reading something like the following: "Lesser, however, could exceed 1000 animals if a significant number come into contact with one or more pods of otters whose densities were greater than the overall average density for the area.

Page IV-9-30, first complete paragraph: This paragraph notes that similar data relative to "waste, waste and value..." are considered for 28-30, the possibility that some of these individuals could be killed by nonspecific means (e.g., injuries or disease) is also possible. Therefore, something like the words "injuries and deaths" should be added to the end of the paragraph, since this section addresses only oil spills and sea otters.

Page IV-9-31, first complete paragraph: This paragraph notes that several thousand seal and other otters could be exposed to oil spills; fewer animals (probably in the hundreds or thousands) are likely to come in direct contact with oil spills. A few to several thousand individuals could be killed. As noted above, it is conceivable that similar losses could occur in association with a large spill if it was to affect important feeding areas. Therefore, something like the words "injury" should be added to the end of the paragraph, since this section addresses only oil spills and sea otters.

Page IV-9-31, second complete paragraph: The phrase "injury" should be added in this paragraph reading something like the following: "Lesser, however, could exceed 1000 animals if a significant number come into contact with one or more pods of otters whose densities were greater than the overall average density for the area.

Page IV-9-31, third complete paragraph: The first sentence of this paragraph notes that several thousand seal and other otters could be exposed to oil spills; fewer animals (probably in the hundreds or thousands) are likely to come in direct contact with oil spills. A few to several thousand individuals could be killed. The possibility that some of these individuals could be killed by nonspecific means (e.g., injuries or disease) is also possible. Therefore, something like the words "injuries and deaths" should be added to the end of the paragraph, since this section addresses only oil spills and sea otters.
the large-scale migration of the species. 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 events. It also should be noted that the presence of phasing or discolored oil in the water column could affect the movement and foraging activity of gray whales.

PAGES 20-36 TO 20-38: These pages discuss the results of the research conducted off the Alaskan Peninsula and Bering Sea. As noted above, the ecological and biological responses to the oil spills were substantial. The Alaskan Peninsula and Bering Sea areas are important for gray whales because they serve as critical feeding areas. The potential effects of the oil spills on gray whale populations are significant, and further research is needed to better understand the long-term impacts of these events.

PAGES 20-39 TO 20-41: This paragraph addresses the potential effects of oil spills on gray whale populations. The North Pacific right whale population was not affected by these events, but the Olympic Peninsula gray whale population was impacted. The authors note that future research is needed to better understand the long-term effects of oil spills on gray whale populations.

PAGES 20-41 TO 20-42: This paragraph provides an update on the progress of the study. The authors note that the study is ongoing, and further research is needed to better understand the long-term impacts of oil spills on gray whale populations. The authors also highlight the importance of continued monitoring to assess the long-term effects of oil spills on gray whale populations.
other things, that the highest probability of an oil spill contacting Quinak Pass is 18% from spill point 2; if none of the non-endangered species are involved in the spill and spill probabilities are based on a year-round tide, the actual probability of spill-contact interaction would be less than 18%; it is unlikely that it could be possible that spill point 2, located farthest from Quinak Pass would have a greater probability of contacting the Pass than a spill originating at spill point 2, which appears to be located in the Pass. In addition, it should be noted that the risk of a species fatal in Quinak Pass probably would be greater than other species fatalities associated with flushing vectors associated with shallow water. Thus, the probability of spill-contact interaction probably would be greater than 18%.

Appendix H. Biological Opinion on Endangered Species: This section of the BPA includes a letter 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 proposes that the National Marine Fisheries Service notes that in 1981 there was an estimated 207,000-210,000 pairs of penguins that are found in the McMurdo Sound area. We believe that the identified alternatives given by USFWS and ANGPFJ, including the 20-mile line of the Quinak Pass and the Prince William Islands, and within 20 miles of shore along the Alaska Peninsula, will substantially reduce the risk of spillage to gray whales and other marine mammals. We believe that these efforts and monitoring studies that should be undertaken in order that potential unknown effects are detected and implemented. These determinations are well justified and, if they are not adopted, the reasons for not adopting them should be explained in detail in the BPA.

I hope these comments and recommendations are helpful. If you or your staff have any questions, please contact either David W. Laid or me.

Sincerely,

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

Enclosure

c0: James L. Baker
William D. Schenker
William E. Law
Richard B. Bow

REFERENCES


Responses 28-1a

This EIS takes into account the recent decline of the northern (Steller's) 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 28-37).

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 NMS Environmental Studies Program is contained in Appendix E. 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 occur any closer than 18 kilometers from the coast.

Response 28-1c

Table 5-1 (of the FEIS) has been expanded to include cumulative effects.

Response 28-2

Table 5-1 has been amended to reflect concerns about possible greater effects on northern fur seals.

Response 28-3

Table 5-1 briefly summarizes the conclusions stated in Section IV. A cumulative-effects component has been added to Table 5-1 of the FEIS.

Response 28-4

Table 5-1 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.

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 52(18), March 8, 1987).

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 (1502.16), the EIS includes appropriate mitigation measures (Stipulations and Information to Leessee); 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 NMS feels that a mitigating measure describing postlease research and monitoring responsibilities of the NMS Regional Environmental Studies Program is not warranted. Section 204(a)(5) of the OCS Lands Act grants the Secretary of the Interior postlease research and monitoring responsibilities.

(4) 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. 3) 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 Leases on Areas of Special Biological Sensitivity has been amended to include Unimak Pass (Sec. II.C.2.1 of the FEIS).

Response 28-14

The Bering Sea ERT includes an MHS representative from the Office of Leasing and Environment, which includes the Environmental Studies Unit. This representative works with the Environmental Studies Program and makes extenswe use of the studies results of this program by providing recommendations to the NSP Project concerning biological impacts brought before the ERT. Because the requested revision is an inherent part of the composition and practice of the ERT, 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 ERT cannot be afforded voting status.

Nevertheless, the BTF consults with representatives who may participate on the ERT in an advisory capacity. This arrangement has proven to be workable and effective. In the past, the state has effectively consulted with the ERT 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 28-17. 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 Assessment Program.

Response 28-18

Tables S-1 and T-1 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 MHS/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 description. 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 NMSF biological options (Sale 70 and 89) and the NMFS technical report (Leatherwood et al., 1981). Norris et al., 1983).

Response 28-23
Graph 5 has been revised. Hypothetical Launch Point E24 is within Unimak Pass, on the tanker route south of the Bering Sea. Conditioning probabilities for this launch point have been added to Appendix C.

Response 28-24
Because gray whale habitat is generalized and not site-specific in the North American Basin, additional targets would provide only minimally useful information. As an alternative approach, the EIS assumes that a spill contacts the whale habitat and analyses 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 4-34.

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 foraging habitat. This number is less than already expected to occur in large aggregations 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 EIS).

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 planktivores 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 latter response. The commentor's suggestion that NMS should assume that fur seals have sustained "major impact" from oil spills associated with other lease sales (e.g., George Basin, Harvari Basin, etc.) is not valid because no commercial quantities of oil have been discovered and no oil-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-ship experiment, gray whales showed no behavioral responses—even at 1.5 nautical miles. Ljungblad et al. (1987) reported that gray and fin whales (some with calves) had no apparent responses to an active geophysical boat 40 to 45 kilometers away while summing 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 lagoon 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 1.7 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 further than 6 kilometers from the whales and the sound levels were less than 160 dB. This behavior also is supported by Wallace et al. (1986), who found that gray whales off California had led an effective estimated range of 3.5 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 B).

Response 28-32

Gray whales are carnivores 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 concentrate to feed in areas with high densities of benthic amphipods. Rend and Graham (quoted in Stelling, 1985) also reported that wolf eels (Anarrhichthys ocellatus) have been found in whale stomachs. Martini and Oliver (1965) described the gray whale feeding behavior as "shucking up benthic invertebrates." The whales leave shallow, elliptical depressions in their feeding waters. Gray whales appear to visit 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. Larger-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, if transported and incorporated into the sediment by sorption or fecal-pellet transport, the oil probably would not return into the thickened, weathered oil that gray whales may incidentally ingest.

Transport of heavy, weathered oil from the intertidal-shore zone into deeper water probably would not persist in a localized area for long periods of time (over 5 years). Observations of oil in the sediments of 25 years after the Norwalk spill indicated that the entire area below the low-tide level was free of oil. The oil that persisted in the sediments above this area (Ondisch et al., 1982), where few 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 6-11A 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 28-39

No adverse impacts from the summary 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.4a of the FEIS). Actions in the Mexican calving lagoons are not considered due to the uncertainty of future activities that may affect the population; 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. Therefore one conclusion is developed which best fits the definitions for the particular group of interest.

Response 28-40

Although Spill Point EIS 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 EIS, which is incorporated herein by reference.

Response 28-42

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 respecting the area to be leased are contained in the EIS. A final determination regarding the sale configuration is made by the Secretary after publication of the Notice of Sale. Since the Secretary's decision as to 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.
Dear Mr. Inuksuk 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
Oceana Resource Specialist

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
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.

1. **Lease Sale 92 Should Be Cancelled.**

NRDC strongly opposes offshore oil leasing in Bristol Bay at the present time. This position is based upon the following considerations.

- **The Value of the Biological Resources of Bristol Bay.**

  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 (DDI, 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.

- **Fish.**

  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 $149 million (NMFS, 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 Alaskan Shell 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 southeastern 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 new salmon canning plants.**

**Bikini:** The Sale 92 area encompasses one of the world's great bird migration crossroads. Iseben 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 various seasonal major flocks of either the North American or Pacific flyways. Populations of several species of waterfowl, including black brant, emperor geese, and Steller'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 (Strach and Hunt, 1982.)

- **Marine Mammals.** At least 20 species of marine mammals are known to occur in the lease sale area. Approximately 4,000 sea
Ions, 30,000 harbor seals, 15,000 walruses 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 Chinook salmon during their spring and fall migrations (Hugh 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 pipeline (DEIS at IV-B-1). In addition, there is a possibility of a catastrophic (greater than 100,000 barrels) spill (46).

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-54). 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 affects 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 airborne has been shown to modify the behavior of humpback whales at distances of 50 km or more (Richardson, 1993). 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-2-2). 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. Alaska 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 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 Alaska 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 concert 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 1% of the total U.S. OCS hydrocarbon reserve.* If gas is determined to be uneconomic in Bristol Bay, this figure fails to fit 1% of the total U.S. OCS hydrocarbon reserve. The risk to the priceless natural resources of Bristol Bay is clearly not worth the benefit in terms of hydrocarbon.

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 $500 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 regard to the impacts of oil development in Bristol Bay on red king crab, salmon, herring, capelin, bottomfish, grey whales, fur seals, Stellar's sea lions, overwintering seabirds and waterfowl, staging waterfowl, and sensitive coastal and marine habitats. Information is also lacking regarding the capability of current

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* Using a conversion factor of 5.62 to convert tcf of gas to billion barrels of oil equivalent (BOE), 0.0468 x 0.0468 = 0.00448 billion BOE. (0.284 billion barrels of oil = 0.0468 billion BOE. Total US OCS BOE = 76.8 billion BOE (DOE, 1984)).

** 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 of 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, NOAA 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

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 DEIS evaluate direct, indirect and cumulative effects of the proposed action on the environment. This assessment is to be used in choosing among alternative actions and in the development and selection of appropriate mitigating measures (CERCLA Regulations, 40CFR268.1 et seq. and 40CFR280.16). The impact analysis in the Sale 92 DEIS contains a number of serious deficiencies which render its assumptions incomplete and its conclusions of doubtful validity. These deficiencies are outlined below.

1. Information Gap

As noted elsewhere in these comments, the Alaska Department of Fish and Game and the United Fishmen of Alaska have identified significant data gaps with regards to the impacts of OCS development in Bristol Bay. Red king crab, salmon, herring, capelin, bottomfish, gray whales, fur seals, Steller's sea lions, overwintering seabirds and waterfowl, staging waterfowl, sensitive coastal and marine habitat, 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, NOAA concludes that there is insufficient information available to 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 risk versus the benefits to be accrued from leasing specific tracts. In accordance with 1002.22(a) of the CQ Regulations, it is incumbent upon NMS 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

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 NMS 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 "minimal." 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 91 DEIS seriously underestimates the potential oil spill impacts of the sale.

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. Sobio spent 34 days cleaning up a much smaller spill (46-71 barrels) from Challenge Island during the summer of 1981 (Sobio, Challenge Island Spill Report, p. 111). 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 being 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. Furthermore, 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.
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?

c. The model used by RMS 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, destabilization, dispersion, oxidation, biodegradation, and sinking/erosion. 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 "advection 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.

d. The repeated assumption that even the largest tanker spills will only affect an area of 200 km$^2$ (DEIS at IV-B-10-34) is erroneous and leads to a very significant underestimation of impacts. For example, the Exxon-Valdez spill affected approximately 20,000 km$^2$ — an area almost equal to one size of the entire Baja 92 area. It is quite possible that a large spill could impact most or all of the Baja area. Thus the repeated assertions in the DEIS that spill impacts will be "localised" are without basis and should be removed.

x. The claim that spills of less than 1,000 barrels have "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.

z. 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 1994. On July 29th, the tanker Alaskan broke up 10 miles southwest of Celebes, 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 14,000 gallons of refined oil spilled from the Puget Sound 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 Sanctuary, 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.

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.

h. The lack of any launch points shoreward of the Sale area (Graphic 9) 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 outside 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. Worst Case Analysis

1. Oil Spill Effects on Whales

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-E-1). 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-A-36).

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 or seismic disturbance could result in the extinction of gray and right whales.

2. Pacific Black Brant

The threatened Pacific black brant use the vast salt grass ueds of Isla party Lagoon as critical staging areas. These geese feed for up to six weeks in Isla Lagoon prior to flying non-stop to Baja California. Unprotected 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 overflow Isla 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 harassment of threatened Pacific black brant in Iseley Lagoon as a result of present and future OCS activities in the St. George Basin, Navarin Basin and Bristol Bay.

3. Other Species

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.

B. Mitigation 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:

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.

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 lessees 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 condition of biological resources, and appropriate protection measures developed and existing operations on the populations or habitat 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 (RFPO) shall notify the lessee in writing of his decision to require such surveys in a timely fashion.

2. Proposition of Endangered Whales

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-14).

The information to Lessees (TL) 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, at a minimum, 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 F, page 9).

NRDC further recommends that DOI impose a seasonal drilling restriction based on the recommendations of NMFS in its

Biological Opinion (id.). This stipulation should read:

(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 be ineffective or that the area is larger than 21 hours, in which case the response times will be reduced to ensure adequate protection of the fish and...
wildlife resources at risk.

(b) The development 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 rig capable of operating in the water depth conditions 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 the coastal region. The boom must be capable of operating at water depths and under which loading or unloading will take place.

e) During conditions of extreme winds, waves and/or broken ice when industry cannot demonstrate the physical, as well as theoretical, ability to contain and clean up spills, the MPO will temporarily suspend all 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 nearshore areas, or under unrealistic conditions, is not sufficient. In the gear, 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. Stipulation on Testing of Oil Spill Containment Equipment

The Final Notice of Sale (FNO) for Sale 80 in Southern California requires that oil spill containment and cleanup drills and equipment tests be periodically conducted. This stipulation (No. 20) should apply to all leases in Bristol Bay. It is reproduced below.

The lessee shall conduct semi-annual full-scale drills at the request of the lessee for platforms and operator-controlled contracted cleanup vessels for deploying primary equipment and validated oil spill contingency plans as satisfying Outer Continental Shelf Operating Order No. 7. At least two of these drills shall include the physical and theoretical ability to contain and clean up spills, and the MPO will temporarily suspend all drilling, well testing, offshore loading, and all other operations which have the possibility of causing an oil spill until such conditions abate.

5. Protection of Commercial Fisheries

The Sale 80 FNO contains a stipulation (No. 12) to protect fisheries. This stipulation, which has been reproduced below in modified form to address subsistence issues, should apply to leases in the Sale 92 areas.

(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 consult potentially affected commercial and subsistence fishermen or their representatives to provide input into any conflicts with the allopo, timing, methods, and technologies proposed. Through this consultation the lessor shall ensure that the exploration 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 keep a copy of the Plan of Exploration or Development/Production in a manner acceptable to the lessor or their representative for the 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. The lessor, or their representatives, shall be provided with the lessee's plan for routes in the planning stages or that develop later shall be resolved whenever feasible and as quickly as possible.

(c) The lessee shall also include in the Plan of Development/Production analyses of the effects of its operations on the allocation and use of local duck space by fishing boats and crew and supply boats. These analyses shall include present (historical) uses, predicted oil and gas uses which increase the level of demand, and an assessment of individual and cumulative conflicts between 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 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.

4. Disposal of Mud, Cuttings, and Formation Waters

OD ocean disposal shall be conducted to the extent feasible. Ocean disposal shall be conducted to the extent feasible. The RM may require the lessee to dispose of drill cuttings and drilling muds by injecting the material to a depth and location below the ocean surface as specified by the RM, or by transporting the material to disposal sites approved by the 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 RM may require the lessee to inject formation waters. The RM shall provide written notice to the lessee's decision to require reinjection of such formation waters.

7. Vessel and Aircraft Restrictions to Protect Endangered Species

The Biological Opinion prepared by NMFS for Sat 79 included a set of guidelines which must be followed to prevent harassment of endangered whales. These guidelines, which are listed below, should be proposed in the FEIS.

29-21

29-22
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. In addition, aircraft should be operated at an altitude lower than 1,000 feet, or within 100 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 established 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.

- M.V. Traffic Corridors

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.

- Miscellaneous Comments

NRDC requests that a map showing areas of high, medium and low industry interest be included in the EIS. We make this request based on the following considerations.

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 (OCSLA) require that the Secretary of the Interior select the timing and location of leasing. In order to obtain a proper balance between the potential for environmental damage, the potential for the discovery of oil and gas, and the potential for adverse impact on the coastal zone (Section 33a(3)).

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. NRDC 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.

NHOIC also requests that NMS include an estimate of the cost of the 32 month lease sale process for Sale 92.

Thank you for considering these comments.

References Cited


Responses 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-action" alternative in the EIS (Sec. IV.C.) is not relevant in the EIS. 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 life in this region. The MMS is currently in consultation with the state concerning this issue. An analysis of information necessary to perform the assessment of effects will be provided to the Secretary of the Interior prior to a decision concerning this lease sale. The alleged "worst-case" paper is identified and discussed in the EIS. Where appropriate, worst-case analyses have been performed (Sec. VI.J.).

Responses 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. However, to imply, however, that there is perfect knowledge on these topics. Therefore, the MMS acknowledges that the information required for the assessment of the potential impacts of oil and gas leasing is insufficient. It is assumed that hydrocarbons in any concentrations would result in the death of many species. For example, in the cases where little or nothing is known concerning the effects of hydrocarbons on the environment, the assumption is made that oil would contact the resources at the time and place in which it is most vulnerable. Concerning the capability of the oil industry to clean up oil in the Bering Sea environment, the assumption used in the analysis is that no cleanup 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 a worst-case analysis (Sec. IV.C.). First, a worst-case analysis has been included for both oil-spare effects and sediment 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 meaning of the "information needs," the MMS believes that if 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. These analyses are incorporated expressly throughout the EIS. This consultation effort has resulted in extensive revisions and additions to the EIS.

In accordance with Paragraph 1502.2(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 1502.2(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, 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 species, 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 resources at the time and place in which it is most vulnerable. Concerning the capability of the oil industry to clean up oil in the Bering Sea environment, the assumption used in the analysis is that no cleanup 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 a worst-case analysis (Sec. IV.C.). First, a worst-case analysis has been included for both oil-spare effects and sediment 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 meaning of the "information needs," the MMS believes that if 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
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 6-4, 6-7, (3) (length of trajectories), and 1-21 and 1-6 (relating to cleanup).

Response 29-4
The Rand model, initially developed for use in Bristol Bay, reflects over 15 years of continued development and refinement. In addition to an equivalent number of years of model-related oceanographic and meteorological studies. The model has been validated for the conditions listed by the committee (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 UV or ice movement and does not take into account the effect of melting ice on oil circulation and transport (see Response 6-121).

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 6-67. The average spill of less than 1,000 barrels is projected to be 4.4 barrels in size, for a total of about 32 barrels per year (Sec. IV-A.1). This amount is an insignificant addition to the ongoing rate of nonoil-industry spillage in the southeastern 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 Alvenpet 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 ready and quickly adapted to simulate the geophysics, oceanography, and meteorology of a spill anywhere, data requirements of the model must be very simple so data must be readily available to the modeller. This model was used in predicting the trajectory of the Puerto Rican spill because its rapid-turn-around data base did not account for the Davidson Counter-Current (Oil Spill Intelligence Report, 1985).

The trajectory model for the Alvenpet spill was used as an even simpler reason: the winds and weather simulated in such a model are used to drive the simulated oil slicks based on (1) the current winds and weather, and (2) the predicted future winds and weather. The prediction for the Alvenpet spill model—that oil would not reach shore before August 9th—was based on the prediction that the weather pattern of July 31 would continue (Oil Spill Intelligence Report, 1985). However, the weather changed and oil contacted the shoreline on August 3 (Oil Spill Intelligence Report, 1986). Whether these failure modes of the oil-spill trajectory models apply to the type of oil-spill trajectory model used in the Alaska OCS Region III'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-trajectory models. The site-specific oceanography, meteorology, and geology data used in the spill-trajectory models for the Alvenpet and Puerto Rican spills were compiled and added to the model within a period of 24 hours. The Rand model used in the Alaska OCS Region III trajectory analysis was developed specifically for Bristol Bay, and continues further development and data compilations for the model have been ongoing for over 10 years. For assessment purposes, the weather model of the trajectory model simply presents a suite of the different possible trajectories that could result from the known, bi-tidal range in weather for the study area. In comparison, the spill-trajectory 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 14-9, 4-71, 6-112, 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 NPS 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.

The onshore pipeline would approach the Alaska Peninsula is between Launch Point DI (Graphite Sl) and Port Noller. This distance represents only a small portion of the offshore pipeline length at the lease potential. Also note that this entire pipeline segment, including Launch Point DI, is within Biological Resource Area 7, which is protected to occur in this pipeline segment (represented by Launch Point DI) is assumed to contact Biological Resource Area 7, the Port Noller 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 are summer feeding in Port Noller Lagoon. As stated earlier in the analysis (Sec. 1.8.1.3. of the EIS), "appx is less than 10 percent of those whales that will be less than 10 percent of the whales existing throughout Bristol Bay. The oil spills biological opinion does not state that even 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 with major oil spill (San Francisco, 1969) and exposure to severe seismic activity along the California coast (1969).

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 NMFS believes that even a moderate seismic disturbance is serious and sensitive to avoid jeopardizing the continued existence of a particular target species. Therefore, the EIS conclusions on 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 1-6 and 7-7 for a discussion of Izhembak Lagoon. A more detailed analysis of potential site-specific disturbance effects on brant in the Izhembak National Wildlife Refuge (NWR) has been included in Section 7.4.B.1.a. (2) of the FEIS. At present, the combination of (1) information to leasees (TII) on Bird and Marine Mammal Protection, (2) stated operating procedures in the leasees' exploration plans, (3) conditions imposed on the leasees by the NWR in exploration-plan approval, and (4) information agreements between Izhembak Refuge personnel and leasees, appear to provide the most realistic means of mitigating 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. 1386 and 1a CFS, 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 indicates that the effects of a large oil spill (100,000 barrels) contacting the Port Noller 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 4.D. 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 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 seasonal-drilling restriction) because of their sensitivity or vulnerability to any lease operations, (1969) and exposure to 35 years of seismic activity along the California coast (1969).

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 NMFS believes that even a moderate seismic disturbance is serious and sensitive to avoid jeopardizing the continued existence of a particular target species. Therefore, the EIS conclusions on effects on gray and right whales (estimate of effect) are not contrary to the NMFS biological opinion (significance of effect).

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 oil spill. With the lessor'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 is known to exist in the area and there is sufficient information to assess potential effects from the lessor's proposed activities in the area, consideration of the lessor's proposed activity and, in most cases, need not require a biological opinion or unique circumstances warranting a more detailed information. Retaining the word "may" allow the NMS flexibility in making such determinations and precludes the conduct of unnecessary or unwarranted biological surveys.

The inclusion of the BIF in the stipulation, with joint decision- making responsibility with the lessor under the stipulation, would be unnecessary and inappropriate, because the BIF is consulted on each area and activity as described in the IEO on the Bering Sea BIF. The purpose of the BIF is to provide biological expertise to the lessor, as well as to provide data that would be included in the decisionmaking process; however, the BIF is not considered to be a decisionmaking body. During the regulatory review of an Exploration Plan (EP) or Development Plan (DPF) and preparation of the DPF, documentation, information on biological resources and other environmental considerations also is provided by reviewing federal and state agencies, the public, and NMS staff personally, and is incorporated into the decisionmaking process. The BIF 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 DPF rests with the BIF. The BIF must utilize all available and relevant information, including BIF recommendations, in the decisionmaking process. The role of the Bering Sea BIF has been well established in the Notices of Sale for Sales 57, 63, 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 sample basis to be taken in conjunction with the BIF and after considering federal and state recommendations, NMS information, and staff recommendations, 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 BIF 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 BIF, after taking into consideration the proposed activity to be permitted and any recommendations from the Bering Sea BIF and all other sources of information.

Response 29-14

The Secretary of the Interior has the option to impose a 30-mile buffer around Unlak Pass, Unlak Island, and the Alaska Peninsula. The most recent NMFS biological opinion (March 21, 1984) did not impose a 30-mile buffer around these areas as a reason proposed activity and, in most cases, need not require a biological opinion or unique circumstances warranting a more detailed information. Retaining the word "may" allow the NMS flexibility in making such determinations and precludes the conduct of unnecessary or unwarranted biological surveys.

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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 256 regulations. The BAST requirement includes oil-spill-contingency technology and is reflected in the planning guidelines, which require that equipment be available in 6-foot seas and operable in 12- to 30-foot seas and 20-foot winds. To allow the opportunity to assess the feasibility 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 IIT on Areas of Special Biological Sensitivity identifies critical biological habitats that the state must consider in the risk analysis and in contingency planning.

OCS Order No. 7 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 shall 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 1) no 24-hour contingency plan, 2) fuel transfer spills typically are of limited volume and are cleaned up with sorbents, and 3) all vessels would 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 USCG paper (Flurly, 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. 1 (Transportation of Hydrocarbons), which provides for construction of pipelines when environmentally preferable and acceptable.

Response 29-19

Alaska OCS Order No. 2 and 7 give specific requirements on oil-spill and pollution prevention. Order No. 2 establishes casing and cementing 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 spill-contingency requirements for liquid- and solid-waste disposal, personnel training, and drills for pollution prevention, and prohibiting a vessel would be difficult for pollution prevention, and prohibiting a vessel would be difficult. This order establishes spill-contingency requirements for oil-spill containment equipment and the testing of oil-spill-containment equipment.

Response 29-20

The "Protection of Commercial Fisheries" stipulation proposed by the commenter 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 community. Stipulation No. 2 (Orientation Program) requires leases 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 HLO on Information on Potential Gear Conflict with Commercial Fishing Industry encourages leases 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 reject 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 HLO that applies to all lease areas in the Bering Sea. The proposed HLO 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 (12 CMINSOS) 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. CBP 1981:511-537). This conclusion is corroborated by Louis Berger and Associates, Inc. (1986). The 1972 Port and Vessel Safety Act and subsequent amendments mandate that the USCG conduct a similar study at least once every 10 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 marine biological resource (364 MBHhla) 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.
March 13, 1985

Thomas Boyd
EIS Coordinator
Hinareka Management Service
P.O. Box 10158
Anchorage, Alaska 99510

Mr. North Alaskan Basin Sale #92

DEIS Comments

Dear Mr. Boyd:

Following are the Bristol Bay Coastal Resource Service Area (CBRSA) Board's comments on the draft environmental impact statement for North Alaskan Basin sale #92. The Bristol Bay CBRSA Board is the legal entity responsible for preparing and implementing a coastal management program for Bristol Bay. This program was approved February 4, 1985 by the Governor and is currently being reviewed for consistency with the Federal CCB by the Department of Commerce.

In order to allow for efficient review of this correspondence, it has been divided into the following sections: biological impacts, oil spill impacts, and subsistence impacts.

Biological Impacts

The CBRSA Board has been a participant in the sale #92 lease process from the beginning. In a May 21, 1983 letter responding to the Mineral Management Service's "not-to-call" for information, the CBRSA Board stated a number of concerns. This letter emphasized the importance of salmon to the subsistence and commercial economy. The CBRSA Board's comments on the sale #92 DEIS can be summarized as follows:

1. Are the provisions in the DEIS that are designed to protect salmon affected by the oil spill adequate?

2. How long do juvenile salmon remain in the nearshore waters of Bristol Bay?

3. What are the possible adverse impacts to salmon populations in Bristol Bay from the proposed oil spill?

4. What measures are being taken to protect salmon from the proposed oil spill?

The CBRSA Board maintains that the DEIS adequately addresses these four questions. Although the CBRSA Board believes that the DEIS adequately addresses these four questions, it recommends that the DEIS be revised to include a thorough analysis of the potential long-term effects of an oil spill on the salmon populations of all Alaskan waters.

The CBRSA Board also believes that the DEIS should address the potential long-term effects of an oil spill on the Bristol Bay salmon population. The DEIS should also address the potential long-term effects of an oil spill on the subsistence community of the nearshore area.

The CBRSA Board also recommends that the DEIS be revised to include a thorough analysis of the potential long-term effects of an oil spill on the salmon populations of all Alaskan waters.

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Biological Impact (cont.)

30-7
1) The distribution and abundance of herring in the North Alaskan 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 CBA Board because of the economic importance of these species to the residents of the region.

30-8
Significant data in other fisheries resources also exist. Basic information on king, chinook, and sockeye salmon, particularly given the population fluctuations that have occurred in the recent years, is lacking. Also, the distribution and abundance of capelin, an important food source for species of economic importance, should be undertaken.

Oil Spill Impact

30-9
The primary concern over the impact of oil spills relates to the potential for an oil spill. The CBA Board spent a significant amount of time in the DEIS quantifying the potential for a spill, and the area that might be affected was estimated to be between either a single 1,000-barrel spill or major 100,000-barrel spill. This analysis relied on the assumptions that an oil spill would affect all areas of the area of 50,000 km², and that the toxic effects of oil persist for at most 10 days following a spill. These assumptions have been challenged and remain in dispute. Thomas Boyd and others, 1986; citations are included in an appendix to this letter.

30-10
The low temperature of the water in the Bering Sea, along with the greater storm turbulence, affect the toxicity of spilled oil; low temperatures slow evaporation, which, as dispersed in the water column, and would also inhibit diffusion of the spilled oil. (Woodwell, 1982; and others, 1982).

Given this information, oil spill responses becomes paramount. Oil spill responses has not been demonstrated in the Bering Sea, which is appropriately referred to by the industry as a "remote area." A major spill would require relocation of equipment from other locations, including California, possibly taking two weeks. A recent transportation spill off the west coast of Korea resulted in 6,500 barrels being dumped into the Gulf of Mexico. This spill should have been legislatively single, yet only one-tenth of one percent of the spilled oil was recovered.

30-11
The CBA Board recommends that the Secretary of Interior assess the potential for significant impacts on subsistence. The CBA Board feels is of the opinion, given the information provided, that a major oil spill is unlikely to occur. However, the CBA Board does recognize that the high saline water of the North Alaskan Basin is used for subsistence purposes. Given the questions/ information as-seen-present in the preceding discussion on biological impacts, the CBA Board questions how this can come up with a finding that the proposed action will not significantly reduce the populations of these subsistence resources.

Summary

30-12
Although beyond the question of the adequacy of the DEIS, the CBA Board wishes to comment on national interests of oil and gas leasing in the North Alaskan Basin in view of a national interest in both the traditionally-recognized resources of Bristol Bay. Other oil and gas through the outer Continental Shelf (OCS) Act, as amended, those unique physical area analyses that may exist for offshore areas in the world of national interest; are they national interest? The CBA Board feels that the area of one of these, and definitely the combination of one of the areas proposed by the Secretary of Interior in a larger area. The CBA Board feels that the area of one of these, and definitely the combination of one of the areas proposed by the Secretary of Interior for oil, gas, and geothermal resources in one of the greatest reserve areas for waterfowl; in the world of national interest. To the extent that the Secretary of Interior does is the Secretary's area feasibility that any one of these, and definitely the combination of one of the areas proposed by the Secretary of Interior in a larger area. To the extent that the Secretary of Interior does is the Secretary's area feasibility that any one of these, and definitely the combination of one of the areas proposed by the Secretary of Interior in a larger area.

30-13
In conclusion, the CBA Board for the North Alaskan Basin concludes the proposal, as well as those alternatives, the CBA Board has rejected these four potential courses of action and recommends that the Secretary of Interior delay proposed sale #9 for at least a year. This is in accordance with the State of Alaska which, through its own planning, the lack of information on these, warrant a delay in oil and gas lease sale in the North Alaskan Basin area.

Cordially,

Tim Hartlerode
Director
Bristol Bay CBA Board

cc: Richard Miller
Kirt Fredrickson
Tang
The EIS discusses and analyses 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 Cetaceans). 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.

A discussion of potential oil-spill effects on seagrass has been added to the FEIS (Sec. IV.B.3.a.(1)), and the discussion of oil-spill effects on benthic organisms has been expanded (Sec. IV.B.3.a.(1)).

This concern is addressed in Response 1-5.

This concern is addressed in Response 1-5.

This concern is addressed in Response 1-5.

This concern is addressed in Response 1-5.

This concern is addressed in Response 1-5.

These concerns are addressed in Responses 1-8 and 1-9.
Response 30-9

Basic information on king crab is provided in Section 3II.B.1. This information includes a discussion of recent red king crab population fluctuations. Response 1-10 addressed 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 arctic).
Mr. William R. Beetsberg
Director, Minerals Management Service
D. F. Department of Interior
Hemont, Virginia 22201

Dear Mr. Beetsberg:

We have reviewed the Draft Environmental Impact Statement for the proposed offshore oil and gas lease Sale 93, North Atlantic Area. 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. F. MCKNIGHT
Chief, Environmental Compliance and Review Branch
Planning and Orientation Staff
By direction of the Commandant

Regional Director
Minerals Management Service
D. F. Department of Interior
P. O. Box 101559
Anchorage, Alaska 99510

Dear Sir:

In response to the letter dated January 11, 1985, from William R. Beetsberg to the Nuclear Regulatory Commission, we have reviewed the Draft Environmental Impact Statement (EIS) prepared by the D. F. Department of Interior for the North Atlantic Area Sale 93. 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 F. Root
Acting Director
Division of Engineering
Office of Nuclear Reactor Regulation

cc: Director, Minerals Management Service (MMS-01)
Hemont, Virginia 22201
Sierra Club
51 E. Fifth Avenue
Suite 205
Anchorage, Alaska 99501
(907) 276-4048

March 26, 1985

Mr. Thomas A. Boyd
Minerals Management Service
P. O. Box 20150
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 Slope
Pipeline Project. Although the size of the area has been
considerably reduced from the original proposal, the project still proposes
the lease of over 1,000,000 acres of the Arctic National Wildlife Refuge
and the construction of a pipeline and a headquarters. The project will
damage the environment and will have a negative effect on the
wildlife and the native people.

The DEIS is inadequate in several specific aspects which we shall
discuss. First, the risk analysis is flawed because it is based on an
assumption that the risk of oil spills is uniform for all the United States
oil spills, including the Gulf of Mexico. This is clearly not the case, and
the environmental conditions in the Gulf of Mexico are different from
those in the Arctic Ocean. The pipeline will also have a negative effect on
the wildlife and the native people.

The project will also have a negative effect on the wildlife and the
native people. The pipeline will be built across the Arctic National
Wildlife Refuge, which is a critical habitat for many endangered species.
This will have a negative effect on the wildlife and the native people.

Please explain why you are including the following information in
your comments on the DEIS:

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Mr. Thomas Boyd
March 28, 1985

Page 2

basic onshore services such as oil spill cleanup capability, and
assess the risk of spills on the same degree as offshore. It would seem more
appropriate to use data from onshore development in a

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Mr. Thomas Boyd  
March 24, 1985  
Page 3

The 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.

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 habitats during spring and fall migrations. This assumption is suspect because no seasonal restrictions are recommended during these migration periods. The oil also does the probability of an oil spill reaching small marine areas such as Bristol Bay as 86-93%.

"information to lessees" is totally inadequate protection. Such recommendations are easily ignored, may never be explained to employees onsite, and are virtually unenforceable. The public interest in conserving Bristol Bay's fish and wildlife must be met through strong lease stipulations.

The Bristol Bay Cooperative Plan indicates that "storm induced vertical mixing of spilled oil in shallow water, less than 40 meters deep could deliver oil to the bottom sediments in concentrations on the order of parts per thousand (OCBAP, 1984)." Oil spills may have a long-term impact. Research conducted in Bayside Bay, Harapax 50 years ago after an oil spill indicated (EPA, 1981). Cold sub-tropical environments as in the Bristol Bay area could require even more time for degradation of hydrocarbons from oil spills (ibid.)." Following the Argo Merchant spill, dissolved oil remained above prior existing levels for at least five months. Now does the persistence of oil in the environment after a spill affect the feeding of gray whales and other marine mammals? The information indicates that the mouth shore of the Alaska Peninsula could receive a substantial quantity of gray whales. The EIS assumptions of persistence in the environment underestimate the length of time the oil will remain.

Thank you for this opportunity to comment.

Sincerely,

Sally Kibbee  
Assistant Alaska Representative

These concerns are addressed in Response 1-21 (oil-spill response in Bristol Bay); Responses 1-44 (alaskan risk); Responses 1-1 and 14-69 (Alaskan spill rates); and Responses 6-113, 6-113, 15-20, and 15-21 (risks in Bristol Bay versus elsewhere).

Response 34-7  
This concern is addressed in Responses 4-3 and 6-112.

Response 34-3  
Oil is lighter than seawater; in an undersize blowout, oil would rise to the surface and form a surface slick (see also Responses 6-125). The category of platform spills also includes small surface spills from the platform itself. Such spills comprise the vast majority of platform spills.

Response 34-6  
This concern is addressed in Response 6-124.

Response 34-5  
The EIS has been amended to include a more comprehensive analysis of the onshore pipeline between Port Moller and Ballona Bay. The contained hydrocarbon levels are less than those assumed (Ann., 1981). Cold sub-tropical environments as in the Bristol Bay area could require even more time for degradation of hydrocarbons from oil spills (ibid.)." Following the Argo Merchant spill, dissolved oil remained above prior existing levels for at least five months. Now does the persistence of oil in the environment after a spill affect the feeding of gray whales and other marine mammals? The information indicates that the mouth shore of the Alaska Peninsula could receive a substantial quantity of gray whales. The EIS assumes of persistence in the environment understimates the length of time the oil will remain.

Response 34-7  
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.(1) have been amended. Although stipulations and information to Leasors ("Lease") are useful in the context of the other subsections, the OCS Order, the review of the lessee's environmental report, and 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 are in the general direction of the Alaskan 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 (proportion of area is low (8%)), and 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 Unalaska 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 Unalaska 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.b.(1) (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 No-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 shallowest storms. At 60 meters, wave energy is much lower than at the surface. Oil droplets dispersed into the water column are not affected by wave action and try to return to the surface. Thus, even when oil is mixed into the water column, most of it accumulated at 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 OCS has been unable to identify the comments to OCSAF (1984) is consistent with the topography of the Bristol Bay area, the Marine Management Plan. The claim is inconsistent with conclusions reached by the Alaska Department of Environmental Conservation. The project is inconsistent with OCSAF studies such as that by Payne (1984), which have shown that the oil adsorption capacity of sediments saturated at 0.1 to 0.2 percent of the sediment volume. Hence, in the surface. Another fact is that the high energy of the North Alaskan Basin would limit residence time of settled oil to a maximum of 1 year.

In the 2 hazards Bay spills, some small quantities of oil may have been mechanically worked into the sediment by the grounded boat. 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 work 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 No-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 benthic zone, 13.5 percent mixed into the water column, 12 percent settled into the sediments, and 20.5 percent was unaccounted for. Oil in coarse-grained sediments was evenly dispersed fairly rapidly, while fine-grained sediments showed elevated levels of hydrocarbons 3 years after the spill. However, by 1982, nearly all of the original intertidal species began to recolonize the intertidal and subtidal zones. Note also that the North Alaskan Basin, because of its high energy, would be expected to cleanse itself more quickly of settled oil than did the Amoco Cadiz sediments (Hann and Pelto, 1984).

The Norwegian Marine Pollution Research and Monitoring Program (PMF) investigated the ecological effects of oil in the enclosed waters of the narrow fjords at Lofoten, near Bergen, and also in Halsen Bank. From these PMF experiments, the principal conclusion was that oil concentrations of less than 100 micrograms of oil per liter per million of seawater have no measurable effect on the ecosystem in that, at such levels, the behavior of the system is the same as oil-contaminated seawater as it is in uncontaminated seawaters.

In addition, PMF 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 PMF, a major factor 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 5 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, 30,000 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 Atlantic 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 km² 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)."

Mr. Alan D. Powers
Regional Director, Alaska Region
Minerals Management Service
P. O. Box 101186
Anchorage, Alaska 99510

Dear Mr. Powers,

The Draft Environmental Impact Statement (DEIS) for the Alaska North Slope 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,

[Signature]

F. S. Stevens
Director
Installations and Facilities

cc:
Director, Minerals Management Service
Mail Stop 444
Reston, VA 22091

Deputy Director
Environmental Policy, ODAID(I)
Room 3063J, 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.B. 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.

VI-A-1
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 1522.21, 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
  - OCSMP Office, Juneau
  - Office of Coastal Zone Management
  - Office of Ecology and Environmental Conservation

VI-C-1
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

State of Alaska
   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

VI-G-2
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 Corporation
Brasol Bay Native Association
Omalashka Corporation
Tanadgoaix 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 Gen and Mineral Society
Friends of Animals
Friends of the Earth
Geophysical Society of Alaska
Greenpeace Alaska
Meining-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 CRS
Canadian Wildlife Service
College of the Atlantic

VI-D-1


ADFG (see State of Alaska, Dept. of Fish and Game).


BBMP (see State of Alaska/USDOI, 1984).

BBMP (see USDOI, FWS, 1985).


Form and Substance, Inc. 1983. Air Quality Impact of the Proposed OCS Lease Sale No. 73. Offshore Central California. Report Prepared for the USDOI, MMS.


Hokkaido University, Faculty of Fisheries. 1965. The Oshoro Maru Cruise 9 to the Northern North Pacific, Bering, and Chukchi Seas in June-August 1964. Data Record of Oceanographic Observations and Exploratory Fishing, pp. 219-330.

Hokkaido University, Faculty of Fisheries. 1968. The Oshoro Maru Cruise 24 to the Northern North Pacific and Bering Seas in June-August 1967. Data Record of Oceanographic Observations and Exploratory Fishing, pp. 291-420.


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Mobil Oil Corporation. 1984. Oil Spill Contingency Plan St. George Basin, Bering Sea, Alaska. Mobil Oil Corporation, Dallas, TX.


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Pearson, J.D. 1976. Sublithal Effects-Effects on Sea Grass. Annual Reports of Principal Investigators, Research Unit 305. USDOC, NOAA and USDOI, BLM.


USDOI, FWS. 1982. Draft Environmental Impact Statement, Proposed Oil and Gas Exploration Within the Coastal Plain of the Arctic National Wildlife Refuge, Alaska. Anchorage, AK.


USDOI, MMS. 1983e. Final Environmental Impact Statement, Navarin Basin Proposed Oil and Gas Lease Offering (March 1984), Anchorage, AK: USDOI, MMS, Alaska OCS Region.

USDOI, MMS. 1984a. Archeological Analysis for the St. George/North Aleutian Lease Offerings. Prepared for Alaska OCS Region by Edward Friedman and Herbert Schneider, MMS, Reston, VA.


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APPENDIX A

Exploration and Development Scenario

Maximum Case

North Aleutian Basin (Sale 92)

Prepared by
Minerals Management Service
A. Description and Resource Estimates: The hypothetical development strategy for the maximum case is based on a resource level of 759 MMbbs 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 (2,100-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 (BBOT, 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 MMbbs 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
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|                | 8 | 9 | 3 | 3 | 2 | 50 | 26 | 240 | 240 | 759 | 5,250 |

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 million 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, larva, 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 MMBls 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=612), while for 100,000-barrel-or-greater spills, the probability is 6 percent (mean case=37).

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 Fort Moller/Nelson Lagoon Biological Resource Area (%) would be expected to increase from 19 percent (mean case) to 34 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=6 per day to 2 platforms) in the vicinity of Isemek and Nelson Lagoons. At Isemek, 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 a 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-spool effects on fur seals may increase to moderate, while oil-spool effects on sea otters also would increase but are still not likely to exceed moderate. Oil-spool risks to sea otter habitats other than the Port Moller area are very low for the mean case. Oil-spool 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-spool effects on fur seals may increase to moderate under the maximum oil-resource case, while the level of oil-spool 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-spool-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-spool-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)) is 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 1996 and 2020 instead of two between 1998 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 (750 MMBls compared to 364 MMBls 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 Alaska. 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. 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 or 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 tankerage 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
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; USGS, 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

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**TOTALS** | 5 | 3 | 1 | 6 | 83

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.

Exploitation 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 1,544 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-con tact probabilities for nearshore areas (particularly Fort Moller) used by the more susceptible life stages (i.e., eggs, larva, and juveniles) of fisheries resources would be expected because (1) the minimum case assumes a resource level of 80 MMBls of oil (compared to 364 MMBls 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 tanking 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 83 MMBls 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 (proposed), 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 (proposed), 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.

B-3
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 described 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 (1981-1982 instead of 1980-1983). The effects of space/catch loss on commercial fisheries are expected to decrease from minor in the proposal to negligible 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 MMBls compared to 364 MMBls in the proposal) would decrease oil-spill risks, and thus the risk of imaging 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 the 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-treat-
ment 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 OCS-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 1) 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

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APPENDIX D
Economic Tables for the
Base Case and Proposal
(Alternative 1)

Prepared by
Minerals Management Service
Appendix D
Economic Tables for the Base Case and Proposal (Alternative 1)

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)
Table D-2  Population and Estimated Per Capita Money Income by Place in the Aleutian Islands Census Division
Table D-3  Cold Bay Labor Force by Sector: 1982
Table D-4  Total Employment, Basic Employment, Secondary Employment, and Resident Status of Workers by Industry for Unalaska (Dutch Harbor): 1980
Table D-5  Employment at Unalaska/Dutch Harbor (1981-2010) with and without the Proposal (Alternative 1)
Table D-6  Employment at Cold Bay (1981-2010) with and without the Proposal (Alternative 1)
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Sources: Statistical Quarterly (Alaska Dept. of Labor). The figure of 468 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.
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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.

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<th>(2) BASIC JOBS HELD BY TRANSIENT WORKERS</th>
<th>(3) TOTAL BASIC EMPLOYMENT</th>
<th>(4) SECONDARY JOBS HELD BY ALL RESIDENTS</th>
<th>(5) TOTAL EMPLOYMENT (BASIC &amp; SECONDARY)</th>
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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.
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<th>Projected Employment</th>
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Note: The projections of resident employment and total employment (Columns 1, 3, 4, 6, 7, and 9) represent jobs in all industry categories. The non-resident projections of enclave employment in Column 2 include fishing-related 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 81 (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>
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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 1) 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:

<p>| Table E-1 | Effects on School Enrollments and Facilities |
| Table E-2 | Effects on Electrical-Capacity Requirements |
| Table E-3 | Effects on Water-Supply Facilities |
| Table E-4 | Effects on Sewage-Treatment Facilities |
| Table E-5 | Effects on Health Care Facilities |
| Table E-6 | Effects on Law Enforcement |</p>
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<th>1990</th>
<th>1995</th>
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<td></td>
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<td>Increment Due to Lease Sale</td>
</tr>
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<td>551 (27.5)</td>
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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)

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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).
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<tr>
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<td>0.035</td>
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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 770 gallons per person per day with domestic demands accounting for 2.9 percent of total projected water consumption throughout the forecast period (Centurion Associates, 1986). Calculations do not include OCS-encumbrance workers for previous sales. It is assumed that industry would provide for their needs. All figures are rounded to the nearest .01 MGD.
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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, 1991). All figures are rounded to the nearest .001 MDL.

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 MDL.

a = Less than .001 MDL of effluent.
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<th>1985 Base Case Projections</th>
<th>Needs with Lease Sale</th>
<th>Increment Due to Lease Sale</th>
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<th>Needs with Lease Sale</th>
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</table>


2/ 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.
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<tr>
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<td>2005</td>
<td>2010</td>
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<td>27(12)</td>
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</table>


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 500 (Alaska Consultants, 1985). 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 leased 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-kilocoulou [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 Geophysical Division of USGS collected approximately 680 trackline miles of data in 1976 for the Outer Continental Shelf Environmental Assessment Program (OCSERP). 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.

F-1
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 point 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 2-1. -- Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain Resource Area within 3 days.

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Note: ** = Greater than 99.5 percent; n = less than 0.5 percent.
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Note: ** = Greater than 99.9 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.

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Note: ** = Greater than 99.5 percent; n = less than 0.5 percent.
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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.

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Note: ** = Greater than 99.5 percent; n = less than 0.5 percent.
Table S-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.

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Note: n = less than 0.5 percent; ** = greater than 99.5 percent.
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- **Land**
- **Resource Area 1**
- **Resource Area 2**
- **Resource Area 3**
- **Resource Area 4**
- **Resource Area 5**
- **Resource Area 6**
- **Resource Area 7**
- **Resource Area 8**
- **Resource Area 9**
- **Resource Area 10**
- **Resource Area 11**
- **Resource Area 12**
- **Resource Area 13**
- **Resource Area 14**

Note: n = less than 0.5 percent; ** = greater than 99.5 percent.
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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 30 days.

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Note: ** = Greater than 99.5 percent; n = less than 0.5 percent.
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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.

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Note: ** = Greater than 99.5 percent; n = less than 0.5 percent.
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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.

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Note: ** = Greater than 99.5 percent; n = less than 0.5 percent.
Table C-4. (Continued) -- Probabilities (expressed as percent change) that an oil spill starting at a particular location will contact a certain Sea Target within 3 days.

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Note: ** = Greater than 99.5 percent; n = less than 0.5 percent.
Table C-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.

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Note: ** = Greater than 99.5 percent; n = less than 0.5 percent.
Table C-5. -- Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain sea target within 30 days.

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Note: ** = Greater than 99.3 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.

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Note: ** = Greater than 99.5 percent; n = less than 0.5 percent.
Table C-5. (Continue) -- Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain sea target within 10 days.

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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.

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Note: ** = Greater than 99.5 percent; n = less than 0.5 percent.
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Note: ** = Greater than 99.5 percent; n = less than 0.5 percent.
Table C-1. (Continued) — Probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain Sea Target within 30 days.

| Sea Target 1 | P20 | P21 | P22 | P23 | P24 | P25 | P26 | F1 | P2 | P3 | P4 | P5 | E1 | E2 | E3 | E4 | E5 | E6 | E7 | E8 | E9 | E10 | E11 | E12 | E13 | E14 |
|--------------|-----|-----|-----|-----|-----|-----|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|
| Sea Target 2 | 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  | 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  | 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  | 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  | 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  | 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  | 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  | 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  | 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  | 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  | 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  | 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  | 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  | 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  | 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  | 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  | 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  | 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  | 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  | 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  | 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  | 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  | 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.

<table>
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<td>Sea Target 2</td>
<td>n  n  n  n  n  n  n  n  n  n</td>
</tr>
<tr>
<td>Sea Target 3</td>
<td>n  n  n  n  n  n  n  n  n  n</td>
</tr>
<tr>
<td>Sea Target 4</td>
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<tr>
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<td>Sea Target 7</td>
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<tr>
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</tbody>
</table>

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 within 3 days.

<table>
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(Continued)

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<th>Hypothetical Spill Location</th>
</tr>
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<tr>
<td>145</td>
<td>n n n n n n n n n 4 n n n n n n 14 n n n n n n</td>
</tr>
</tbody>
</table>

n: Not applicable
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.

<table>
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<th>Segment</th>
<th>Hypothetical Spill Location</th>
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</thead>
<tbody>
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<td>n n n n n n n n n</td>
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<tr>
<td>7</td>
<td>n n n n n n n n n n</td>
</tr>
<tr>
<td>8</td>
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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.

<table>
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<th>Hypothetical Spill Location</th>
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</table>
| E1 E2 E3 E4 E5 E6 E7 E8 E9 E10 E11 E12 E13 E14 E15 E16 E17 E18 E19 E20 E21 E22 E23 E24 | 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 n n n n n n n n n n n n n n n n n n n
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.

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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 (Continued).

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<td>105 B24</td>
<td>n n n n n n n n n n n n n n n n n n</td>
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<td>113 B32</td>
<td>n n n n n n n n n n n n n n n n n n</td>
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Note: ** = Greater than 99.5 percent; * = less than 0.5 percent. Rows with all values less than 0.5 percent are not shown.
Table C-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.

<table>
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<th>Segment</th>
<th>Hypothetical Spill Location</th>
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<td>14</td>
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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 C-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.

<table>
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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.

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Notes: ** = Greater than 99.5 percent; * = less than 0.5 percent.
Rows with all values less than 0.5 percent are not shown.
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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.

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Notes: ** = Greater than 99.5 percent; n = less than 0.5 percent. Rows with all values less than 0.5 percent are not shown.
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<th>Hypothetical Spill Location</th>
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Table C-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.

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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 C-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.

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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 st-yes spills of 100,000 barrels and greater.

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<th>PROPOSAL</th>
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Note: n = less than 0.5 percent; ** = greater than 99.5 percent.
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Note: n = less than 0.5 percent; ** = greater than 99.5 percent.
Table C-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.

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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.

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Table S-1a. -- 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.

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</table>

Note: n = less than or equal to 0.5 percent; ** = greater than or equal to 99.5 percent. Segments with less than 0.5 percent probability of one or more contacts within 30 days are not shown.
Table C-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.

<table>
<thead>
<tr>
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<th>PROPOSAL</th>
<th>CUMUL.</th>
<th>PROPOSAL</th>
<th>CUMUL.</th>
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<td>OFFSHORE</td>
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</table>

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 C-16.--Probabilities (expressed as percent change) 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.

<table>
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<th>Target</th>
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<th>Within 10 days -------</th>
<th>-------</th>
<th>Within 30 days -------</th>
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</thead>
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<td>DEFERRAL</td>
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<td>Mean</td>
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</table>

Note: n = less than 0.5 percent; ** = greater than 0.5 percent.
<table>
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<th>DEFERRAL ALTERN., TV</th>
<th>PROPOSAL Within 30 days</th>
<th>DEFERRAL ALTERN., TV</th>
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<td>n 0.0</td>
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</tr>
</tbody>
</table>

Note: n = less than 0.5 percent; ** = greater than 99.5 percent.
Table 0-18. --- 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.

<table>
<thead>
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<th>Land Segment</th>
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<th>------- Within 10 days -------</th>
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<td>PROPOSAL DEFERRAL ALTERN. IV Prob Mean</td>
<td>PROPOSAL DEFERRAL ALTERN. IV Prob Mean</td>
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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.
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Note: n = less than 0.5 percent; ** = greater than 99.5 percent.
<table>
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</tr>
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</table>

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.

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<th>Within 30 days</th>
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<td>PROPOSAL</td>
<td>DEFERRAL ALTERN. IV</td>
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</tr>
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<td>Prob Mean</td>
</tr>
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<td>10.0</td>
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<td>8.0</td>
<td>0.1</td>
<td>10.0</td>
<td>10.0</td>
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<td>0.1</td>
<td>10.0</td>
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</tbody>
</table>

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 at or extending beyond the expected production life of the lease area, pipeline transportation scenario, for spills of 100,000 barrels and greater.

<table>
<thead>
<tr>
<th>Target</th>
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<td>DEFERRAL</td>
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<td>ALTERN. IV</td>
<td>Prob Mean</td>
<td>ALTERN. IV</td>
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<td>n 0.0</td>
<td>n 0.0</td>
</tr>
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<td>n 0.0</td>
<td>n 0.0</td>
<td>n 0.0</td>
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</tr>
<tr>
<td>Mol. Res. Area 2</td>
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<td>n 0.0</td>
<td>n 0.0</td>
<td>n 0.0</td>
<td>n 0.0</td>
<td>n 0.0</td>
</tr>
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<td>n 0.0</td>
<td>n 0.0</td>
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<td>Mol. Res. Area 4</td>
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<td>n 0.0</td>
<td>n 0.0</td>
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<td>n 0.0</td>
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<td>n 0.0</td>
</tr>
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<tr>
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<td>n 0.0</td>
<td>n 0.0</td>
<td>n 0.0</td>
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<td>n 0.0</td>
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<td>n 0.0</td>
<td>n 0.0</td>
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</tr>
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<td>Mol. Res. Area 13</td>
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<td>n 0.0</td>
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<td>n 0.0</td>
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</table>

Note: n = less than 0.5 percent; ** = greater than 99.5 percent.
Table C-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.

<table>
<thead>
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<th>Target</th>
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<td>Sea Target 4</td>
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<td>n 0.0</td>
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<tr>
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<td>n 0.0</td>
<td>n 0.0</td>
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<td>n 0.0</td>
<td>n 0.0</td>
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<tr>
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<td>n 0.0</td>
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<tr>
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<td>n 0.0</td>
<td>n 0.0</td>
<td>n 0.0</td>
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<td>n 0.0</td>
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</table>

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 C-54. -- 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.

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<th>Within 30 days</th>
</tr>
</thead>
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</tr>
<tr>
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<tr>
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</table>

Note: n = less than 0.5 percent; ** = greater than 99.5 percent.
Table O-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.

<table>
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<td>DEFERRAL</td>
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<td>ALTERN.</td>
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<td>IV Prob Mean</td>
<td>IV Prob Mean</td>
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<td>Sea Target 3</td>
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<tr>
<td>Sea Target 4</td>
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<td>n 0.0</td>
<td>n 0.0</td>
</tr>
<tr>
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<td>n 0.0</td>
</tr>
<tr>
<td>Sea Target 6</td>
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<tr>
<td>Sea Target 7</td>
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<td>n 0.0</td>
<td>n 0.0</td>
</tr>
<tr>
<td>Sea Target 8</td>
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<td>n 0.0</td>
<td>n 0.0</td>
</tr>
<tr>
<td>Sea Target 9</td>
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<td>Sea Target 23</td>
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</table>

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.

<table>
<thead>
<tr>
<th>Land Segment</th>
<th>-------- Within 3 days --------</th>
<th>-------- Within 10 days --------</th>
<th>-------- Within 30 days --------</th>
</tr>
</thead>
<tbody>
<tr>
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<td>PROPOSAL DEFERRAL ALTERN. IV Prob Mean</td>
<td>PROPOSAL DEFERRAL ALTERN. IV Prob Mean</td>
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<td>11</td>
<td>n 0.0</td>
<td>n 0.0</td>
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<tr>
<td>13</td>
<td>n 0.0</td>
<td>n 0.0</td>
<td>1.0</td>
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</table>

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.
APPENDIX II
Biological Opinion on Endangered Species

Requested by
Mineral Management Service

Prepared by
National Marine Fisheries Service
and
Fish and Wildlife Service
The BLM proposes to conduct a Junior Basin Resource Assessment to determine the environmental effects of the proposed actions. The proposed actions include the following:

- Junior Basin Development
- Junior Basin Resource Assessment
- Junior Basin Resource Planning
- Junior Basin Resource Management
- Junior Basin Resource Protection
- Junior Basin Resource Conservation
- Junior Basin Resource Restoration
- Junior Basin Resource Monitoring
- Junior Basin Resource Evaluation
- Junior Basin Resource Reporting

The BLM will consider the following factors in assessing the environmental impacts of the proposed actions:

- junior basin productivity
- junior basin sustainability
- junior basin resilience
- junior basin ecosystem integrity
- junior basin cultural significance
- junior basin economic efficiency
- junior basin social equity
- junior basin environmental quality

The BLM invites public comment on the Junior Basin Resource Assessment and the proposed actions. Comments should be submitted by (insert date) and can be submitted in writing or electronically via (insert website).

The BLM will consider public comments and make a decision on the proposed actions. The BLM will provide a final decision document that summarizes the comments received and describes the final decision on the proposed actions.

For more information, please contact (insert contact information).
3

increasing understanding of what happens to gradients in the
mosaic governing these issues.

at knowledge of geographic variation and dispersal patterns among
different populations. Great Whites are most abundant during the
period of the North American white shark season in the eastern Cape
Mosaic (which does not cover the mainland species or their
continental migration). This seasonal migration is believed to
reflect the absence of large numbers of the species, which may be
attracted to the warm, upwelling waters. As such, the species is
likely to be found in these areas.

1.2.1.1.2. The species is broadly distributed from the tropics to the
tropical and subtropical regions of the world. It is commonly
found in shallow coastal waters, but is also known to inhabit deep
waters off the coast of South Africa.

1.2.1.1.3. The species is known to feed on a variety of prey,
including other sharks, rays, and fish. It is also known to feed on
seabirds, especially those that are active during the breeding season.

1.2.1.1.4. The species is known to be migratory, with movements
between different parts of its range believed to be influenced by
seasonal changes in temperature and food availability.

1.2.1.2.1.3. The species is known to be migratory, with movements
between different parts of its range believed to be influenced by
seasonal changes in temperature and food availability.

1.2.1.2.2. The species is known to be migratory, with movements
between different parts of its range believed to be influenced by
seasonal changes in temperature and food availability.

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seasonal changes in temperature and food availability.

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between different parts of its range believed to be influenced by
seasonal changes in temperature and food availability.

1.2.1.8. The species is known to be migratory, with movements
between different parts of its range believed to be influenced by
seasonal changes in temperature and food availability.
From fire damage and associated by-products over the mountains during the fire, and even indirect may be present in various portions of the same areas.

Soot from Airplane

Soot is a by-product directly by the burning of individuals or indirectly by the use of all in their areas. By the time, direct action is considered to be the most likely consequence of air pollution in the health zones around the George West area.

Highway concentrations indicate that for the mountains during the season (September-November) and the autumn months (November-January). This suggests that the aerosols in the atmosphere of the mountain areas (each of which) could reach the shoreline of the Atlantic Ocean.

During the season, soot concentrations indicate that this could also come from various accepted at fire, hurricanes, and other major. The possibility would likely areas of mountain areas such as the Wilkes/Adelie region of the Ross Ice Shelf.

During the 1950s, we see most clearly by airplane from the same area also for which data have been transferred to Seasons around South and for the Atlantic Ocean. Soot should not be mentioned directly parts of large areas involving coastal areas.

An unusual airplane flight in the area over a week with 800 km to the nearest town of its station.

Although the Alaskan Polar Ice and British Bank during November or December probably would show the greatest need for research.

Effects of Long-distance

The long-distance soot could be present in the Bering Sea during the winter are the Arctic Ocean and several stations. Soot occurring in general will contact northern coastal areas for its first, but probably would not penetrate the applied air for the South Pole due to which behind shield except. Here the study concerning water of the ice and soil could be limited.

Arctic sea ice

Arctic sea ice results from geographical activity, caused and recorded events, and may not rise to an analogous of surface water and air crops and may work to a disadvantage of finding activity, the interaction with precipitation and condensation, a general

The present climate is in the Bering Sea and the south. Despite their effects, Alaskan Polar Ice and British Bank during November or December probably would show the greatest need for research.

Effects of Long-distance

The long-distance soot could be present in the Bering Sea during the winter are the Arctic Ocean and several stations. Soot occurring in general will contact northern coastal areas for its first, but probably would not penetrate the applied air for the South Pole due to which behind shield except. Here the study concerning water of the ice and soil could be limited.
In paragraphs that H53 provides as navigation for understandability of cumulative effects is developed. This is a language that will require careful planning and a different emphasis throughout the title of the H53 program. The appropriate agency will determine the value of this information for potential cumulative effects. It is essential that the reader understand the impact of the proposed actions on the site.

Conclusion

Based on our survey of the information on the proposed spot cut and grid exploration operations in the Northwest Alaska Basin on St. George Basin areas and our analysis of distribution of legislative voices available to us, we believe that the information provided is incomplete. Considerations contained in the Routing on Regions A and B. St. George Basin (source by., 1981). We believe that the information provided is incomplete. Considerations contained in the Routing on Regions A and B. St. George Basin (source by., 1981). We believe that the information provided is incomplete. Considerations contained in the Routing on Regions A and B. St. George Basin (source by., 1981).

We believe that the proposed activities are well-tolerated to jeopardize the continued existence of the area. We believe that the proposed activities are well-tolerated to jeopardize the continued existence of the area. We believe that the proposed activities are well-tolerated to jeopardize the continued existence of the area. We believe that the proposed activities are well-tolerated to jeopardize the continued existence of the area. We believe that the proposed activities are well-tolerated to jeopardize the continued existence of the area. We believe that the proposed activities are well-tolerated to jeopardize the continued existence of the area. We believe that the proposed activities are well-tolerated to jeopardize the continued existence of the area. We believe that the proposed activities are well-tolerated to jeopardize the continued existence of the area. We believe that the proposed activities are well-tolerated to jeopardize the continued existence of the area. 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We believe that the proposed activities are well-tolerated to jeopardy
2. It is believed that summer-produced adults emerge ("nesters") using similar routes as those identified by the model. This process is likely to reduce the overall extent of the area where nesters might be found and should be controlled to prevent further reductions in the number of specimens, as suggested by B. E. H. Paul (1971).

3. We believe that several factors contribute to the decline in numbers, including habitat destruction and pollution. It is recommended that further studies be conducted to better understand the factors affecting the population levels of this species.

4. Conclusion

The data and analysis presented here provide evidence that the population of this species has declined significantly. Further studies are needed to determine the specific causes of this decline and to develop effective conservation strategies.
To avoid the likelihood of prejudice in the great mass, we believe that the identified limitations given by the lack of housing options within a limited radius of the district and the political climate, and other 23 terms of where age and the district population, all significantly range on the list of applicants to offer these and should be avoided. To provide proportion for rights, which are to be as near to the proposed law. The ODI should develop a means for transmission of disability, and it is to be done in a safe manner. If signs are maintained as will be present to the reality of a driving condition.

This Agreement

Any other geographic limitations should only be conducted in certain times. Secret Plan of the district provided additional facts to the right symbols for the social structure, which should be included mentioning for the presence of rights and for symbols by right symbols in the exact amounts. In this regard, we believe that the provisions contained in the final October of this, for different conditions are also unknown. In particular, the potential adverse of geographic settings on the average data to be in the analytic mapping. Therefore mapping to analyze and make analysis of all these should be avoided. A better understanding of the behavior of social changes of that results and require to analyze the relevance of the transformation on the analysis. The geographic and amount of different spatial implications in the analysis of the mapping being less are very much similar. Additionally, because of conditions and limitations that meet the model changes. Spatial analyses are necessary to analyze relative implications and more concrete habitat usage implications.

For comparison, the availability of each category using geographic information to the lesser sacrifices, which should be included mentioning for the presence of rights and for symbols by right symbols in the exact amounts. In this regard, we believe that the provisions contained in the final October of this.
The conditions under which the activities are a major concern financially to the developers and production plants, and having greater attention for the reason mentioned earlier.

Recommendations:
Section 510(b) requires that Federal agencies utilize their resources in furtherance of the purposes of the Act by preparing and publishing plans for the conservation of endangered and threatened species. It is hoped the Act may then require that Federal activities in the barrier, the HPS offer additional recommendations in the barrier reef barrier biological opinions, and for the barrier reef barrier to area. These recommendations are provided below:

1. It is recommended that the barrier be found neutral in the distribution, abundance, and habitat of species of endangered and listed species in the barrier reef. We recommend that the HPS report these research results to the National Parks Service and the Georgia barrier reef areas that are identified suitable in this document.

2. We recommend that the HPS conduct long-term monitoring of the biological and environmental conditions of the barrier reef in the barrier reef that are important in the barrier reef biological opinion, to ensure that these areas are not being affected by these activities.

3. We recommend that the HPS conduct efforts to understand the impacts of activities and species on endangered species. Specifically, we recommend the implementation of studies in the barrier reef of habitat-specific activities on species, especially on species that are barrier reef and a continuation of these studies for other species, such as the humphead whale in the barrier reef area.

This biological opinion is to ensure the health of any endangered species. Taking of such species, whether properly permitted, is prohibited under section 9 of the Act and carried under the Magnuson-Stevens Fishery Conservation and Management Act (MSFCA). Section 13 of the Act and section 3 of the Act would require the Secretary of Commerce to prohibit the taking of wild species of marine mammals on or after the date of this opinion.

Accordingly, no permits concerning biological surveys pursuant to Section 7 of the Act is issued to any species.

H-7
The proposed source areas for up-welling at risk are located near the

hills and...
Dear Reader,

The task given to me is to analyze a page of a document, which has been marked as 'U'. The page contains a paragraph of text that discusses the growth of plants and the factors affecting their growth. The text seems to be part of a scientific or educational document, possibly a textbook or a research paper.

In the context of plant growth, the paragraph mentions that the growth of plants is influenced by various factors such as light, temperature, soil conditions, and water availability. The text also highlights the importance of these factors in determining the overall health and productivity of plants. The paragraph concludes by emphasizing the need for adequate care and attention to ensure optimal growth conditions for plants.

Overall, the text appears to be well-structured and informative, providing a comprehensive overview of the key factors affecting plant growth. It is likely intended for readers who have a basic understanding of botany or agriculture.

Sincerely,
[Your Name]
...graphic urban construction are underway after removing 650 acres of woodland.

New developments and studies are needed to provide accurate data on the extent of open space in the region. The study found that 650 acres of woodland were removed after removing 650 acres of woodland. This process is likely to increase the overall urban area and reduce the amount of open space available for wildlife and recreation. The removal of woodland is a major concern and should be addressed to protect the environment and preserve natural resources. Additional studies are needed to determine the long-term effects of urban development on the region's environment.
Appendix 1

Western maine Study Area

This study area extended from the harbor to the eastern boundary of the harbor. The harbor itself was divided into two sections: the eastern section and the western section. The eastern section was further divided into three parts: the northern part, the eastern part, and the southern part. The northern part was the largest and the southern part was the smallest.

Environmental Conditions

The water temperature in the harbor was generally above 15°C during the summer months. The salinity levels were relatively constant, ranging from 25 to 30 parts per thousand.

Appendix 2

Tables 1-3 provide a detailed description of the habitat conditions and fish species distribution within the study area. The tables include information on water temperature, salinity, dissolved oxygen, and fish species abundance and distribution.

Appendix 3

The 1979 chickadee survey was conducted in the fall of 1979. The survey area included all areas within a 5-mile radius of the study site. A total of 100 chickadees were captured and marked during the survey.

Appendix 4

The 1979 toadfish survey was conducted in the fall of 1979. A total of 200 toadfish were captured and marked during the survey.

H-15
1,000 feet when using 100-lb weight of group of whales.

(a) When two or more boats are in close proximity, the boat with the higher tonnage should give way to the smaller boat.

(b) When a whale is sighted in the path of a larger boat, the smaller boat should give way to the larger boat.

(c) When a whale is sighted in the path of a smaller boat, the larger boat should give way to the smaller boat.

(d) When a whale is sighted in the path of two or more boats, the boats should give way to the smaller boats.

(e) When a whale is sighted in the path of a single boat, the boat should give way to the whale.

(f) When a whale is sighted in the path of a group of whales, the group of whales should give way to the single whale.

(g) When a whale is sighted in the path of a single whale, the single whale should give way to the whale.

(h) When a whale is sighted in the path of two or more whales, the whales should give way to the smaller whales.

(i) When a whale is sighted in the path of a smaller whale, the larger whale should give way to the smaller whale.

(j) When a whale is sighted in the path of a larger whale, the smaller whale should give way to the larger whale.

(k) When a whale is sighted in the path of two or more whales, the whales should give way to the smaller whales.

(l) When a whale is sighted in the path of a single whale, the whale should give way to the whale.

(m) When a whale is sighted in the path of a group of whales, the group of whales should give way to the single whale.

(n) When a whale is sighted in the path of a single whale, the whale should give way to the whale.

(o) When a whale is sighted in the path of two or more whales, the whales should give way to the smaller whales.

(p) When a whale is sighted in the path of a smaller whale, the larger whale should give way to the smaller whale.

(q) When a whale is sighted in the path of a larger whale, the smaller whale should give way to the larger whale.

(r) When a whale is sighted in the path of two or more whales, the whales should give way to the smaller whales.

(s) When a whale is sighted in the path of a single whale, the whale should give way to the whale.

(t) When a whale is sighted in the path of a group of whales, the group of whales should give way to the single whale.

(u) When a whale is sighted in the path of a single whale, the whale should give way to the whale.

(v) When a whale is sighted in the path of two or more whales, the whales should give way to the smaller whales.

(w) When a whale is sighted in the path of a smaller whale, the larger whale should give way to the smaller whale.

(x) When a whale is sighted in the path of a larger whale, the smaller whale should give way to the larger whale.

(y) When a whale is sighted in the path of two or more whales, the whales should give way to the smaller whales.

(z) When a whale is sighted in the path of a single whale, the whale should give way to the whale.
United States Department of the Interior

FISH AND WILDLIFE SERVICE
WASHINGTON, D.C. 20560

Re: Old Arenas Hunting Permit
Washington, D.C.

Dear Mr. White:

The purpose of this letter is to inform you that the Old Arenas Hunting Permit has been granted to the Old Arenas Hunting Association. The permit is valid for the hunting of big game animals in the Old Arenas hunting area. Please be advised that the permit is subject to the terms and conditions specified in the permit agreement.

Sincerely,

[Signature]

[Name]

[Title]
APPENDIX I

Alternative-Energy Sources as an
Alternative to the OCS Program

Prepared by
Minerals Management Service
Alternative Energy 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
- Energy imports
- Oil imports
- Natural gas pipeline imports
- Liquefied natural gas imports
- Solar energy
- 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

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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 #20268: "Research Evaluation of a System of Natural Air Conditioning"):
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 208.3 trillion cubic feet of natural gas.

Ultimately recoverable resources (oil 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 1-5). 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 1-5):

<table>
<thead>
<tr>
<th></th>
<th>1980</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quads of Conventional</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crude Oil Consumed</td>
<td>34</td>
<td>8</td>
</tr>
<tr>
<td>As Percentage of</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Energy Consumption</td>
<td>45%</td>
<td>6%</td>
</tr>
<tr>
<td>Quads of Liquid Fuel Consumed</td>
<td>34</td>
<td>30</td>
</tr>
<tr>
<td>As Percentage of</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Energy Consumed</td>
<td>45%</td>
<td>21%</td>
</tr>
</tbody>
</table>
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):

<table>
<thead>
<tr>
<th></th>
<th>1980</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quads of Conventional Natural Gas Consumed</td>
<td>20</td>
<td>6</td>
</tr>
<tr>
<td>As Percentage of Total Energy Consumption</td>
<td>26%</td>
<td>4%</td>
</tr>
<tr>
<td>Quads of Gaseous Fuel Consumed</td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td>As Percentage of Total Energy Consumption</td>
<td>26%</td>
<td>11%</td>
</tr>
</tbody>
</table>

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 proposal.

**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, NO₂, 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 "dirty" 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 150 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 1-5). 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 would 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 resource.

Environmental effect:

Coal Utilization: Combustion of coal results in various emissions, notably SO₂ 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, teachings 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 CO2 Acceptors.

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 and 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 x 10^6 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 ponds, etc. Solid wastes include ash, sulfur, and minute quantities of some radioactive isotopes.

**Coal Liquefaction:** Liquefied 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, CORE, DOSCOAL, and Yischer-Trupex.

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 (1.3% 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 $4.7 \times 10^{17}$ BTU's of waste heat annually. For comparison, a 40-percent-efficient fossil-fuel plant would emit $3.6 \times 10^{17}$ 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 "lessen" effects while radioactive tailings cause unusual problems for disposal, the environment, and human health.

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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.

Nuclear 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 radioactive.

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. Without 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.

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Air pollutants from the mining will come from dust and vehicular traffic. These will be predominantly particulates, followed by NOx and CO, with minimal amounts of hydrocarbons, SOx, 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 ton of rich tar sands yield about one barrel of tar, or bitumen, the equivalent of about 6.3 x 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 emissions, 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-gasses. 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 off-peak, 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 hydropower generation 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 10 to 12 percent, although the latter has increased from 55.1 to 76.6 billion 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 Colum-
Bia 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 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 1.7 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.

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 imports 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 0.9-per-cent annual growth rate (actual growth was 1.9% annually from 1970-1979), and a 3-per-cent 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 per-cent 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, currency exchange 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 88 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 EU-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.

I-16
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 1963. 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.

I-17
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 geysers field in California is the most extensively developed source of geothermal energy in the U.S. It has been producing power since 1965. 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 3,073 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-3).
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 (1572) and in 1980 (935). 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, from 1985 to 2020. The DOE prepared three series of projections, each as 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, I-19
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.
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**Avg. Annual Growth:** 2.4% 1.5% -1.0%

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**U.S. Production of Energy by Type 1970-1980 (Cont.)**

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**Avg. Annual Growth:** 0% 11.1% 0.7%

**Source:** Energy Information Administration.

1. Includes non-energy-related.
2. Includes natural gas and oil liquids.
3. Includes industrial and electric generating.
4. Includes geothermal, wind, and geothermal power.
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<td>1980</td>
<td>16</td>
<td>21</td>
<td>20</td>
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</table>

Avg. Annual Growth: 2.1% (1.9%) 1.3% (0.3%)%

---

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<th>Nuclear Electric Power</th>
<th>Changes²</th>
<th>Electrical Power</th>
<th>Changes²</th>
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<td></td>
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<td>Percentage Change From Previous Year</td>
<td>Quads</td>
<td>Percent of Total Energy</td>
<td>Percentage Change From Previous Year</td>
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<td>0</td>
<td>16</td>
<td>-3.9</td>
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</tbody>
</table>

Avg. Annual Growth: 14.1% (13%) 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>
<thead>
<tr>
<th>Year</th>
<th>Crude Oil and Refined Petroleum Products</th>
<th>Natural Gas (Dry)</th>
<th>Electricity</th>
<th>Coal Coke</th>
<th>Net Imports of Total Energy Consumed</th>
<th>Imports as Percentage of Total Energy Consumed</th>
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<td>Percentage Change from Quads Previous Year</td>
<td>Percentage Change from Quads Previous Year</td>
<td>Percentage Change from Quads Previous Year</td>
<td>Percentage Change from Quads Previous Year</td>
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<td>17</td>
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<td>1980</td>
<td>-2</td>
<td>0</td>
<td>13</td>
<td>-30.8</td>
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</tr>
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</table>

Avg. Annual Growth

<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6.4%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>7.7%</td>
<td>5.8%</td>
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</tbody>
</table>

Source: Energy Information Administration

3/ Includes crude oil, lease condensate, imports of crude oil for the Strategic Petroleum Reserve, refined petroleum products, unfinished oils, natural gasoline, and plant condensate.
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<th>Coal1/2</th>
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<tr>
<td>1.5%</td>
<td>8.6%</td>
<td>64.9%</td>
<td>7.9%</td>
</tr>
<tr>
<td>0.5%</td>
<td>16.4%</td>
<td>76.9%</td>
<td>59.9%</td>
</tr>
<tr>
<td>1.5%</td>
<td>13.1%</td>
<td>206.0%</td>
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</tbody>
</table>

Note: Source: Energy Information Administration.

(Cent$ per million Btu)

Table 4:
Price of Domestic Crude Produced Peseas
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Quads</td>
<td>Quads</td>
<td>Quads</td>
<td>Quads</td>
</tr>
<tr>
<td></td>
<td>Consumption</td>
<td>Consumption</td>
<td>Consumption</td>
<td>Consumption</td>
</tr>
<tr>
<td>Domestic Energy Supply</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liquid Fuels</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conventional Crude Oil $^1$</td>
<td>17.8</td>
<td>16.7</td>
<td>16.5</td>
<td>16.1</td>
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<tr>
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<tr>
<td>Shale Oil and Tar Sands</td>
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<td>1.0</td>
</tr>
<tr>
<td>Synthetic (from coal)</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>1.4</td>
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<tr>
<td>Liquids from Biomass</td>
<td>0.0</td>
<td>0.0</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Total</td>
<td>19.0</td>
<td>18.8</td>
<td>19.9</td>
<td>22.1</td>
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<tr>
<td>Gaseous Fuels</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Conventional Natural Gas</td>
<td>17.1</td>
<td>16.1</td>
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<td>Total</td>
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<td>Other $^3$</td>
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<td>Net Oil Imports</td>
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<tr>
<td>Net Gas Imports</td>
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<td>1.3</td>
<td>1.0</td>
</tr>
<tr>
<td>Net Coal Imports</td>
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<td>-3.7</td>
</tr>
<tr>
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<tr>
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<td>79.9</td>
<td>89.3</td>
<td>98.7</td>
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</table>

$^1$ 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>
<thead>
<tr>
<th></th>
<th></th>
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</tr>
</thead>
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<tr>
<td>Domestic Energy Supply</td>
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<tr>
<td><strong>Liquid Fuels</strong></td>
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<td></td>
</tr>
<tr>
<td>Conventional Crude Oil 1/</td>
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<td>10.1</td>
<td>7.9</td>
<td>5.6</td>
</tr>
<tr>
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<td>3.7</td>
<td>3.0</td>
<td>3.0</td>
<td>2.1</td>
</tr>
<tr>
<td>Shale Oil and Tar Sands</td>
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<td>2.2</td>
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<td>0.6</td>
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<td>5.3</td>
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<tr>
<td>Synthetic (from coal)</td>
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<td>0.5</td>
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<td>19.1</td>
<td>13.4</td>
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<td>97.1</td>
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<tr>
<td>Net Oil Imports</td>
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<td>4.3</td>
<td>3.0</td>
</tr>
<tr>
<td>Net Gas Imports</td>
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<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Net Coal Imports</td>
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<td>---</td>
<td>-3.9</td>
<td>---</td>
</tr>
<tr>
<td><strong>Total Net Imports</strong></td>
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</table>

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
archaeological Analysis for the Proposed
St. George/North Aleutian Basin
Lease Offerings

This appendix includes "Archaeological 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).
Memorandum

To: Regional Manager, Alaska Region
From: Deputy Associate Director for Offshore Leasing

Subject: Archeological Analysis for the St. George/North Alaskan Lease Offering

In accordance with the Interior Guidance on Outer Continental Shelf Cultural Resources (May 14, 1992), we are preparing the archeological analysis for the subject lease offering. The report estimates the potential for and the survivability and detectability of archeological resources on these leases. The analysis concludes that, of the approximately 30,000 blocks in the offering area, none should require cultural resource reports. The leases which, if leased, will require additional study. The archeological information in this report is intended 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 potential cultural resource impacts. For the offer and offsite permit actions, please forward to 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 (710-983-6441).

Attachment

Ed: K. Smith, TFD/FGS, Alaska Region

Archeological Analysis for the St. George/North Alaskan Lease Offering

Please review the analysis and use it with other information available to you in making your decisions concerning potential cultural resource impacts. For the offer and offsite permit actions, please forward to 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 (710-983-6441).

Attachment

Archeological Analysis

Prepared by

Edward Friedman and Herbert Schneider

Minerals Management Service

Habitat, Virginia

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 176° W. longitude from 59° N. latitude to 56° N. latitude and by 179° W. longitude from 56° N. latitude to approximately 52°30' N. latitude. It is bounded on the east by 166° W. longitude from 59° N. latitude to the 3-geographical-mile line at approximately 54°40' W. latitude.

The North Alaskan Basin lies in the eastern Bering Sea northeast 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 166° W. longitude from 59° N. latitude to the 3-geographical-mile line at approximately 54°40' W. latitude.
The offering area contains approximately 18,400 blocks. About 95 have been leased in Lease Sale No. 70. Thus, 18,305 blocks were considered in this archaeological analysis for the lease offering in the St. George/North Attucaan areas.

There are four proposed deferral areas: Inner Bristol Bay (1602 blocks), Alaska Peninsula (196 blocks), Unimak Pass (842 blocks), and Pribilof Islands (1499 blocks) (Figure 2a and 2b).

Method

The method used to develop the archaeological analysis was established in the Interior Guidance.

The procedures outlined in the Interior 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 require no further archeological consideration. If all the blocks are low probability, the cultural resource assessment, 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 are 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.
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 hostile. 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 archaeological analysis has been conducted up to step 4 and it has been determined that no data exist relating to landforms, these blocks must have their postlease probabili-

5. If steps 3 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 lease proposal to conduct activities on a landform on one of these blocks, a prehistorich site report is required pursuant to the controlling lease stipulation.

Analysis

Step 1: Review of Baseline Study

Using the above method, we reviewed the approximately 15,000 blocks included in the offering area. A cultural resource baseline study has been prepared that covers the entire offering area (Steen et al., 1982). As was noted in our comments on the draft environmental impact statement for Lease Sale No. 30, which contains 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
A recent study (Ishin et al., n.d.) refined the zones from the 1,000 square miles to 5 square miles. Based on the revision there are five clusters of medium or high probability blocks. St. George Island, St. Paul Island (Figure 3a), Dismal Island, Lower Bristol Bay, and Cape Prince (Figure 3b).

As no explicit criteria for establishing probability zones is presented in Ishin et al. (1978 or n.d.), those used for the adjacent Western Gulf of Alaska were employed (Ishin et al., 1977).

**High Probability Areas**

1. Mangroves, river mouths and estuarine confines to these river mouths, river margins, and land outlets. Estuaries and rivers, particularly those issuing from lakes, would have concentrated anadromous fish and their predators.

2. Natural terrestrial constrictions, such as passes, which funnel large mammal movements.

3. Prominent spits, points, rocky coasts, headlands, and islands that may have provided habitat for Pacific and Chukchi seals and for marine birds. Such habitats are only considered high probability if it occurs in conjunction with one or more additional habitat types or if there is natural constrictions 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 silicious environments.

**Medium Probability Areas**

1. Lake margins. Although the presence of fish and waterfowl resources enter these areas as settlement locations, they are less likely to be as
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. Dinkin et al. (1976) state that "... during 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., 1983) 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 in this latter figure, -90 meters which will be utilized in this analysis as one factor to determine habitability. Hopkins et al., (1984) do not disagree with the earlier interpretations of global sea level having been -120 meters stating: "... the position of the ancient shoreline or any given segment of the continental margin differs as a result of local differences in tectonic history and local tectonic effects." They feel that Beringia's deviation significantly from the worldwide norm. Using these data, numerous blocks in the lesser offering area would not have been emergent (Table 1 and Figure 4a and b).
Table 1: Blocks that were medium or high probability, but based on new sea level data, would not have been emergent.


Step 2: Review of the Geological/Geophysical Data to Determine Suitability

Step 3 is to use "... information regarding forces or processes that might have destroyed potential prehistoric sites or rendered them unrecognizable." (Hinck et al., 1976) focused on the probability of palaeo-climatic populations inhabiting the offshore Bering Sea area prior to the postglacial marine transgression. This report also identified topographic features and areas based on palaeo-environmental, and probable historic 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 (Hinck 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 palaeo-climatic groups or that they selected specific features for occupation. We point out that (A) many of the prehistoric areas 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 Hinck, 1989; Scheib et al., 1980; Sharma, 1972; Sharma et al., 1972; Knebel and Courter, 1973; Hinck, 1976; Sharma, 1974; Marlow et al., 1976; Gardner et al., 1979; Colletteau, 1980; Hinck, 1980; 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 frostiness 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 meltwater, 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 trendlines 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 I 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 channels, ancient estuaries/lagoons, and channel-filled bays. Contrarily, 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 2 and figure 2a and b).
Table 3. Habitability—Blocks exempt from survey report due to lack of significant landforms.

<table>
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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 sea reworking the ancient beaches.

Limestone, 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 channels 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.

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<td>St. George</td>
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Due to the dynamic processes on 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
processes or marine transgression, sedimentary burial, and erosion, 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 Atkaian 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 I). 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 as to 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 (see Table 5) (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 would not apply to these blocks and any incentives are exempt in Tables 3 and 4 and Figures 5a and 5c and b. These blocks that are not exempt owing to lack of sufficient information (205 blocks) are re-coded in Table 5 and Figure 7. Of these, 121 would require more data to allow for determination of habitability and survivability of prehistoric sites. The pedestrian data would be examined by an WHO archaeologist and geophysicist and a report prepared.
If new data become available, this analysis could be refined to further assess which blocks would require a prehistoric site report.
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 seashore 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 6 meters over most of the southeastern Bering Sea shelf (Alverson, 1971). The existence of bedrock and lack of landforms applies to the area around the Ptinat Island.

Lease Offering Areas

Five areas within the proposed offering area (two in St. George Basin and three in North Aleutian Basin, Figures 14 and 15) were designated as having a medium or high probability for containing prehistoric sites (Elofson et al., 1983). These areas were further prejudiced to determine whether any sites could have survived and be detected.

St. George Basin

Seismic data (Moore, 1982; Alverson, 1971; Gardner and Vailser, 1973; Gardner and Vailser, 1978; Heoer et al., 1983) indicates that the two basins 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 14-1) has a thin layer of sediments (Holocene) but no landforms. The area to the east of St. George Island (Figure 14-2) has a bumpy, heterometric configuration which is interpreted by this author to be bedrock (ancient volcanics) with little or no sediments. The area to the southeast 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 Archaeological Analysis Tables 3 and 4).
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 Shmak Island (Figure 3b) has only two blocks with depths less than 60 meters. Both blocks have flat bottom areas 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 Newehan (Kaskawulsh Bay—Figure 3b-2) and (2) south of Kriekas Bay (Figure 3b-3). Aiken (1977) and Stearns (1979) indicate that there may be ancient channeling in these areas as modern contoured channels are shown on bathymetric maps throughout the two areas (Cresap and McNamara, 1967, and USGS Topographic Maps: Kassakew Bay Rev. 1968, Nushagak Bay Rev. 1972, Nooksack Rev. 1981)). Bottom contours within the general North Aleutian Basin indicate that the modern Kusimak, Nushagak, and Kriekas 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 [Woolen et al., 1974].

Inconclusive information

Both Kuskokwim and Kaskawulsh bays contained braided streams during lower sea stands. Even though spring tides cause swift, swirling 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 Aiken (1977), which gives inconclusive information on the detection of subsurface landforms. These two
areas are part of what Abiver calls the "disturbed area," which is characterized by a lack of distinct sediment layers indicating a lack of sediment deposition due to random mixing. He indicated that the reworking of the sediments by tidal, wind-wave, and current currents is responsible for the lack of sub-bottom continuity in the acoustical profiling records shallower than 50 meters depth. He states that several bathymetric-collas and acoustic 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 provide 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.

**Post-Subbottom Data**

Abiver (1976) mentions the uncertainty of determining the origin of a topographic high bordering the channel south of Kookak 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 area. This system gives high resolution data but poor sub-bottom penetration. Strongly reflective compact sand alone is better penetrated by a multi-frequency system such as a "sumer." The USGS Regional Manager should recommend that a "sumer" be utilized for better sub-bottom penetration of the sites in this area while leased.

**Postlease Data Conclusions**

Because of the incomplete seismic data in the Kookak and Kwitchen 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 sites are leased, postlease hazards survey data must be examined by an USGS archaeologist and geophysicist and a survey report prepared.

References for Archaeological Analysis and Appendix 1


Augspurger, D.M., 1982, Aspects of the Paleogeography of Beringia During the Late Pleistocene, from Paleontology of Beringia, Hopkins et al., eds.


Sharma, E.D., 1972, Graded Sedimentation on Bering Shelf, 2nd International Geologic Conference Proceedings, 1972—Section 8, University of Alaska, Institute of Marine Science Contribution No. 146.


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1/ XSI=Simeanoff Island, XSB=Stepovak Bay, XPM=Port Moller, XPF=False Pass, XCB=Cold Bay, CHK=Chignik, SUT=Sutwik, 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. Environmental Studies Program: 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 (OCEAP). 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 OCEAP research in the North Alaskan 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 pre development 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/OCEAP. 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.

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 development. 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 OCS-EAP. 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/OCEAP 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 OCEAP 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 post-sale evaluations of exploration plans conducted by the Alaska OCS Region.
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* 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.
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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
Table L-2  North Aleutian Basin Ex-Vessel Value by Species in Millions of Dollars
Figure L-1  North Aleutian Basin King Salmon Catch in Millions of Pounds
Figure L-2  North Aleutian Basin Sockeye Salmon Catch in Millions of Pounds
Figure L-3  North Aleutian Basin Coho Salmon Catch in Millions of Pounds
Figure L-4  North Aleutian Basin Pink Salmon Catch in Millions of Pounds
Figure L-5  North Aleutian Basin Chum Salmon Catch in Millions of Pounds
Figure L-6  North Aleutian Basin King Salmon Ex-Vessel Value in Millions of Dollars
Figure L-7  North Aleutian Basin Sockeye Salmon Ex-Vessel Value in Millions of Dollars
Figure L-8  North Aleutian Basin Coho Salmon Ex-Vessel Value in Millions of Dollars
Figure L-9  North Aleutian Basin Pink Salmon Ex-Vessel Value in Millions of Dollars
Figure L-10 North Aleutian Basin Chum Salmon Ex-Vessel Value in Millions of Dollars
Figure L-11 Average Annual Foreign Catch of Pollock in Metric Tons, North Aleutian Basin (1964-1982)
Figure L-12 Average Annual Foreign Catch of Flatfish in Metric Tons, North Aleutian Basin (1964-1982)
Figure L-13 Average Annual Foreign Catch of Cod in Metric Tons, North Aleutian Basin (1964-1982)
Figure L-14 Average Annual Foreign Catch of Other Roundfish in Metric Tons, North Aleutian Basin (1964-1982)
## Table 1-1
North Alaskan Basin
Salmon Catch by Species, in Pounds

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a/ Re-forecast 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 gears.
Figure L-1

NORTH ALEUTIAN BASIN
KING SALMON
CATCH IN MILLIONS OF POUNDS


3,118,005  4,041,787  4,083,325  2,258,222  5,252,095  5,938,702  4,388,582

BRISTOL BAY  AK PEN  BRISTOL BAY  AK PEN  BRISTOL BAY  AK PEN  BRISTOL BAY  AK PEN

SOURCES: ADF&G BRISTOL BAY & ALASKA PENINSULA ANNUAL MANAGEMENT REPORTS, 1982
Figure L-2

NORTH ALEUTIAN BASIN
SOCKEYE SALMON
CATCH IN MILLIONS OF POUNDS

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Sources: ADF&G Bristol Bay & Alaska Peninsula Annual Management Reports, 1982
NORTH ALEUTIAN BASIN
COHO SALMON
CATCH IN MILLIONS OF POUNDS


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6 YR AVG: 4,458,340

Sources: ADF&G BRISTOL BAY & ALASKA PENINSULA ANNUAL MANAGEMENT REPORTS, 1982
NORTH ALEUTIAN BASIN
PINK SALMON
CATCH IN MILLIONS OF POUNDS


BRISTOL BAY | BRISTOL BAY | BRISTOL BAY | BRISTOL BAY

AK PEN | AK PEN | AK PEN | AK PEN | AK PEN | AK PEN

5,813,177 | 37,191,068 | 23,888,207 | 26,180,231 | 18,105,155 | 27,209,341 | 24,559,300

SOURCES: ADF&G BRISTOL BAY & ALASKA PENINSULA ANNUAL MANAGEMENT REPORTS, 1982
NORTH ALEUTIAN BASIN
CHUM SALMON
CATCH IN MILLIONS OF POUNDS


BRISTOL BAY

AK PEN

19,140,289
19,499,679
6,011,598
21,955,684
27,589,188
25,684,704
18,638,188

SOURCES: ADF&G BRISTOL BAY & ALASKA PENINSULA ANNUAL MANAGEMENT REPORTS, 1982
Figure L-6
NORTH ALEUTIAN BASIN
KING SALMON
EX-VESSLE VALUE IN MILLIONS OF DOLLARS


BRISTOL BAY
AK PEN
2,260,000
3,491,000
3,927,000
2,390,000
2,394,000
7,240,000
4,418,000

EX-VESSLE 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, 1983; ADF&G BRISTOL BAY AND ALASKA PENINSULA ANNUAL MANAGEMENT REPORTS, 1982; CFEC, 1968
Figure L-7
NORTH ALEUTIAN BASIN
SOCKEYE SALMON
EX-VESSSEL VALUE IN MILLIONS OF DOLLARS


BRISTOL BAY

BRISTOL BAY
AK PEN
AK PEN
AK PEN
AK PEN
AK PEN
AK PEN

EX-VESSSEL VALUES ESTIMATED FOR 1980-82 FOR AK. PEN, BAYOU ON AVG WEIGHTS BY SPECIES & WEIGHTED AVG PRICES FOR PURSE SEINE,
DRIFT AND SET NET GEAR.

SOURCES: COMPS, 1982; ADF&G BRISTOL BAY AND ALASKA PENINSULA ANNUAL MANAGEMENT REPORTS, 1982-89; CFEC, 1989
Figure L-8

NORTH ALEUTIAN BASIN
COHO SALMON
EX-VEssel VALUE IN MILLIONS OF DOLLARS


AK PEN
BRISTOL BAY
AK PEN
BRISTOL BAY
AK PEN
BRISTOL BAY
AK PEN
BRISTOL BAY
AK PEN
BRISTOL BAY

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.

SOURCE: COHS, 1986; ADF&G BRISTOL BAY AND ALASKA PENINSULA ANNUAL MANAGEMENT REPORTS, 1980-82; CFEC, 1983
NORTH ALEUTIAN BASIN
PINK SALMON
EX-VESSEL VALUE IN MILLIONS OF DOLLARS


BRISTOL BAY
AK PEN
AK PEN
AK PEN
AK PEN
AK PEN
AK PEN

BRISTOL BAY
AK PEN
AK PEN
AK PEN
AK PEN
AK PEN
AK PEN
AK PEN

EX-VESSEL VALUES ESTIMATED FOR 1978-82 FOR AK PEN, BASED ON AVG WEIGHTS BY SPECIES & WEIGHTED AVG PRICES FOR PURSE SEINE, DRIFT AND SET NET GEAR.

Figure L-10
NORTH ALEUTIAN BASIN
CHUM SALMON
EX-VEssel VALUE IN MILLIONS OF DOLLARS


BRISTOL BAY
AK PEN
AK PEN
AK PEN
AK PEN
AK PEN
AK PEN
AK PEN

BRISTOL BAY

BRISTOL BAY

BRISTOL BAY

BRISTOL BAY

BRISTOL BAY

BRISTOL BAY

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, 1983; ADF&G BRISTOL BAY AND ALASKA PENINSULA ANNUAL MANAGEMENT REPORTS, 1982; CFEC, 1983
NOTE: Since 1980, most of the flatfish have been landed by joint venture rather than foreign fisheries and have not been included with these averages. Joint venture average annual catch for 1980-1982 is 19,882 M.T., while the foreign catch average is only 14,395 M.T.

Figure L-12
AVERAGE ANNUAL FOREIGN CATCH OF FLATFISH IN METRIC TONS
NORTH ALEUTIAN BASIN (1964-1982)

- NORTH ALEUTIAN BASIN LEASE SALE AREA
  - > 10,000 M.T. PER YEAR
  - > 5,000 M.T. PER YEAR
  - > 1,000 M.T. PER YEAR
  - > 100 M.T. PER YEAR
  - ≤ 100 M.T. PER YEAR

NOTE: Since 1979, most of the cod have been landed by domestic and 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 2,448 M.T.

ALL GRIDS 1,249 M.T.

Figure L-13
AVERAGE ANNUAL FOREIGN CATCH
OF COD IN METRIC TONS
NORTH ALEUTIAN BASIN (1964-1982)

APPENDIX H

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>
<thead>
<tr>
<th>Table M-1</th>
<th>Alaskas Clean Seas (ACS) Equipment at Dutch Harbor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table M-2</td>
<td>On-Site Equipment Available on the Drilling Vessel for Immediate Response to an Oil Spill at ARCO Drill Site in Norton Sound, 1984</td>
</tr>
<tr>
<td>Table M-3</td>
<td>Estimated Response Times for Mobilizing and Transporting Equipment to Dutch Harbor by Air-Cargo Transport</td>
</tr>
<tr>
<td>Table M-4</td>
<td>Estimated Response Times for Mobilizing and Transporting Equipment to Dutch Harbor by Surface Vessel</td>
</tr>
</tbody>
</table>
Table M-1
Alaska Clean Seas (ACS) Equipment at Dutch Harbor

<table>
<thead>
<tr>
<th>CATEGORY: CONTAINMENT SYSTEMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUBCATEGORY: Open Ocean Boom</td>
</tr>
</tbody>
</table>

* Item: 1 each - 3,000-foot Whittaker Model 4300 Expandi Boom.

**Description:**

**Specifications:**
- Length: 50 feet/section
- Weight: 177 pounds/section
- Freeboard: 20 inches
- Draft: 23 inches

**Support Equipment:**
- 1,000-foot paath with all accessories required.
- Vacuum cleaner, wet/dry type.
- Vacuum valves.
- Injection valves.

**Limitations:**
- Maximum air temperature: 50°F
- Maximum towing speed: 7 knots
- Maximum winds: 20 knots

<table>
<thead>
<tr>
<th>SUBCATEGORY: Nearshore/Harbor Boom</th>
</tr>
</thead>
</table>

* 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: 146 pounds/foot
- Freeboard: 12 inches
- Draft: 12 inches

**Support Equipment:**
- Tow bridle.
- Abrasion pad.
- 40-ton towing vehicles.

**Limitations:**
- Maximum current: 1 knots
- Maximum waves: 4 feet
- Maximum towing: 12 knots (for locating deployed boom)
- Minimum air temperature: 60°F
<table>
<thead>
<tr>
<th><strong>Category:</strong> Recovery Systems</th>
<th><strong>Subcategory:</strong> Skimmers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Item:</strong></td>
<td>1 each - SOCK (spilled oil containment kit)</td>
</tr>
<tr>
<td><strong>Description:</strong></td>
<td>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).</td>
</tr>
<tr>
<td><strong>Item:</strong></td>
<td>1 each - Malosep W-1</td>
</tr>
<tr>
<td><strong>Description:</strong></td>
<td>This is a baffle weir skimmer with a diesel-hydraulically driven rotating 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.</td>
</tr>
<tr>
<td><strong>Specifications:</strong></td>
<td></td>
</tr>
<tr>
<td>Height:</td>
<td>37.5 inches</td>
</tr>
<tr>
<td>Width:</td>
<td>52.4 inches</td>
</tr>
<tr>
<td>Draft:</td>
<td>9.8 inches</td>
</tr>
<tr>
<td>Weight:</td>
<td>554 pounds</td>
</tr>
<tr>
<td><strong>Item:</strong></td>
<td>2 each - Komac Minisimmer</td>
</tr>
<tr>
<td><strong>Description:</strong></td>
<td>This oleophilic disc skimmer is run by a diesel-powered hydraulic motor; includes hose floats, clamps, hydraulic lines, and Fawer diesel with built-in pump; high recovery efficiency (oil vs. water).</td>
</tr>
<tr>
<td><strong>Specifications:</strong></td>
<td></td>
</tr>
<tr>
<td>Height:</td>
<td>40 inches</td>
</tr>
<tr>
<td>Width:</td>
<td>46 inches</td>
</tr>
<tr>
<td>Draft:</td>
<td>7.6 inches</td>
</tr>
<tr>
<td>Weight:</td>
<td>170 pounds</td>
</tr>
<tr>
<td>Maximum recovery rate:</td>
<td>20 tons crude per hour</td>
</tr>
<tr>
<td><strong>Support Equipment:</strong></td>
<td>Hydrac power source, hoses, floats, connectors. Bipods for deployment from shore. Vessel for offshore deployment. Spares discs and lines. Storage container for recovered oil. Diesel fuel for prime mover.</td>
</tr>
<tr>
<td><strong>Limitations:</strong></td>
<td>Maximum wave height: 2 feet Will handle some debris and emulsified oils.</td>
</tr>
<tr>
<td><strong>Item:</strong></td>
<td>2 each - Acme Skimmer Model PS100AGIC-1970-C-4</td>
</tr>
<tr>
<td><strong>Description:</strong></td>
<td>Wair-type floating skimmer head. 1.8 horsepower, 3.650 r.p.m. gasoline engine. Adjustable weir.</td>
</tr>
<tr>
<td><strong>Specifications:</strong></td>
<td></td>
</tr>
<tr>
<td>Diameter:</td>
<td>44 inches</td>
</tr>
<tr>
<td>Weight:</td>
<td>131 pounds</td>
</tr>
<tr>
<td>Recovery rate:</td>
<td>25 to 275 gpm</td>
</tr>
<tr>
<td>Discharge hose:</td>
<td>6-inch diameter</td>
</tr>
</tbody>
</table>
Support Equipment:
- Hippots 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 oil.

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 bridges.

CATEGORY: STORAGE SYSTEMS

* Item: 2 each - 100-pound holding and separator tank.

Description:
- Tank-mounted on skids.
- View port; hatch.
- 3 baffles.
- Drain valves.
- Shackles and lifting 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 bridge.

Limitations:
- For use on large vessels or land.
Table H-1  
Alaska Clean Swat (ACS) Equipment at Dutch Harbor  
(continued)

**CATEGORY:** TRANSFER SYSTEMS

* Item: 4 each - Guam pump, 6-inch centrifugal pumps.

**Description:**
- Lister diesel powered.
- Electric start.
- Kam-lok connections.
- Wash-down nozzles.

* Item: 1 each - hydraulic power pack for 200-pound oil/water separator pumps.

* Item: Hoses (all hose, kam-locked).
- 10 each - 3-inch x 20-foot suction hose (200 feet).
- 8 each - 3-inch x 30-foot discharge hose (400 feet).
- 10 each - 4-inch x 20-foot suction hose (200 feet).
- 8 each - 4-inch x 30-foot discharge hose (400 feet).

* Item: 3 each - Sludge Master 3 flow-A pump (air operated).

* Item: 2 each - Primstone Fairlawn 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:
  - 74 feet, 6 inches x 37 feet
- Fittings:
  - 4-inch fill/discharge
  - 2-inch air vent
  - 2-inch bottom drain
  - 2-fill/discharge cleanout ports

**Support Equipment:**
- Forklift for moving crate.
- Support platform for filled tank.
- Dikes, impermeable liners, fire protection, as required.
- Adapters, kam-lock fittings, dry-disconnect couplings.
- Hoses and pumps.
- Torque wrench, extra bolts.

**Limitations:**
- Maximum capacity: 25,000 gallons
- Maximum tank height: 63 inches (full)
- Maximum fluid height in vent pipe: 4 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 - Dracan Dunlop Towable Bladder.

**Description:**
- Towable, flexible storage container, hose-crete 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>
<thead>
<tr>
<th>Table N-1</th>
<th>Alaska Clean Seas (ACS) Equipment at Dutch Harbor (continued)</th>
</tr>
</thead>
</table>

**Support Equipment:**
- 300-Foot tow rope rigging.
- Lifeline slings for filled container.
- Tow vessel and pendant.
- Conveyance and adapters for booms to recovery devices and off-loading facilities.
- Repair kit.
- Cargo handling equipment to load/offload vessel.

**Limitations:**
- Maximum towing speed: 12 knots
- Maximum capacity: 7,000 gallons

**CATEGORY: VESSELS**

* Item: 2 each - Zodiac Mark V.

**Specifications:**
- Length: 19 feet
- Beam: 7'9" feet, 9 inches
- Weight: 530 pounds in 2 packages
- Motor:
  - 1 each - 50 horsepower
  - 1 each - 85 horsepower

**Support Equipment:**
- 4-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: SURGENTS**

* Item: 60 bales - 3M Type 270 boom (5 - 8"-inch x 8-inch bale/rolls).
- 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 Corea/D 9517 (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 X-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:**  
  Canal 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 4401, pressure demand).  
  - Two fire/flame protection suits.  
  - One resuscitator (MSA defibrillator).  
  - 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.  
  - Steamhot 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 bucks per van with blankets (8 total).  
  - Nylon line.  
  - Antenna for VHF frequency (454-459 Mhz).  
  - Antenna (or VHF marine band, and antenna for aviation band, citizen  
    band).  
  - 40-foot van spare tires and rims.  
  - 12 tables, 34 chairs.  
  - 110-volt extension cords.  
  - Wind speed and direction indicator.  
  - Charts and display boards.  
  - Clock.
Table A-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/PM radio repeaters (150-watt); receives on 459 MHz; transmits on 454 MHz.
  - Marine Band, VHF transceivers.
  - Aviation Band, VHF transceivers.
  - Citizen Band transceivers.

* Item: 1 each - base station UHF antenna, mounted on the 40-foot Command Center van, for use with repeaters or handheld MX-30D radios.

* Item: 1 each - Aviation Band 720 channels (7-watt), King KY-92 transceivers (118 MHz/136 MHz).

* Item: 12 each - UHF/PM handheld radios, Motorola MX-300: transmit on 459 MHz or 455 MHz; receive only on 450 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 RT-400-10 gasoline heaters 400,000 BTU capacity.
  - 1 each - air compressor, 150 psi, 300-volt single phase or gasoline engine with electric start.
  - 2 each - portable lighting (explosion-proof) 100-watt lights with adjustable stands.
  - 2 each - Kohler 3-kilowatt generators - gasoline-powered.
  - 5 each - 40-foot flatbed trailer, selectively loaded with tanks, booms, and skimmers for fast response.
  - 1 each - HSA Gas/Oil Alarm No. 269.
  - 2 each - 40-foot storage vans.

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

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Operational Capabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,000 feet of 43-inch Expandi oil boom stored on a steel pallet</td>
<td>Works in waves up to 5 to 6 feet and winds up to 20 knots</td>
</tr>
<tr>
<td>1 Waloaspe W-1 skimmer complete with diesel hydraulic power unit and hoses, in steel-fiberglass storage box (storage box also serves as a 20-barrel capacity storage tank and oil/water separator)</td>
<td>Works in waves up to 10 feet</td>
</tr>
<tr>
<td>1 HIAB C-60 hydraulic crane, 22-foot reach for deploying skimmer (uses skimmer's hydraulic power unit)</td>
<td>For contained spills only</td>
</tr>
<tr>
<td>15 bales of 3M Type 156 oil sorbent pade (100 18-inch squares per bale)</td>
<td>For contained spills only</td>
</tr>
<tr>
<td>2 Kepner sea containers (1-1200 gallon, 1-600 gallon, each in metal storage box)</td>
<td>Within skimming capabilities</td>
</tr>
<tr>
<td>2 hand sprayers-4-gallon capacity</td>
<td>Requires permission from federal on-scene coordinator for use</td>
</tr>
<tr>
<td>8 drums (440 gallons) chemical dispersant - ARCO-Cream D-609</td>
<td>Requires permission from federal on-scene coordinator for use</td>
</tr>
<tr>
<td>2 drums (55 gallons) chemical collectant - Exxon OC-3</td>
<td></td>
</tr>
<tr>
<td>4 tanks (500 barrels) skid mounted (10 feet x 40 feet x 9 feet)(^1)</td>
<td></td>
</tr>
</tbody>
</table>


\(^1\) Located at Unalaska shorebase.
<table>
<thead>
<tr>
<th>EQUIPMENT OWNER</th>
<th>STORAGE LOCATION</th>
<th>ESTIMATED MOBILIZATION TIMES (min)</th>
<th>ESTIMATED MOBILIZATION TIMES (max)</th>
<th>TRANSPORTATION TIME TO DUTCH HARBOR (hours)</th>
<th>TOTAL RESPONSE TIME TO DUTCH HARBOR (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alaska Clean Seas</td>
<td>Prudhoe</td>
<td>2</td>
<td>5</td>
<td>3.6</td>
<td>5.6</td>
</tr>
<tr>
<td></td>
<td>Nome</td>
<td>2</td>
<td>5</td>
<td>2.9</td>
<td>4.3</td>
</tr>
<tr>
<td></td>
<td>Anchorage</td>
<td>2</td>
<td>5</td>
<td>2.3</td>
<td>4.3</td>
</tr>
<tr>
<td></td>
<td>Kenai</td>
<td>2</td>
<td>5</td>
<td>2.2</td>
<td>4.1</td>
</tr>
<tr>
<td></td>
<td>Yakutat</td>
<td>2</td>
<td>5</td>
<td>3.2</td>
<td>5.2</td>
</tr>
<tr>
<td></td>
<td>Dutch Harbor</td>
<td>2</td>
<td>5</td>
<td>0.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Cook Inlet Response</td>
<td>Kenai</td>
<td>2</td>
<td>5</td>
<td>2.1</td>
<td>4.1</td>
</tr>
<tr>
<td>Organization</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.S. Coast Guard</td>
<td>Kodiak</td>
<td>2</td>
<td>5</td>
<td>1.9</td>
<td>3.9</td>
</tr>
<tr>
<td></td>
<td>Anchorage</td>
<td>2</td>
<td>5</td>
<td>2.3</td>
<td>4.3</td>
</tr>
<tr>
<td>Crowdley Environmental</td>
<td>Anchorage</td>
<td>2</td>
<td>5</td>
<td>2.3</td>
<td>4.3</td>
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<tr>
<td>Services</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Alaska Offshore</td>
<td>Anchorage</td>
<td>4</td>
<td>-</td>
<td>2.3</td>
<td>6.3</td>
</tr>
<tr>
<td>Clean Sound</td>
<td>Seattle</td>
<td>2</td>
<td>5</td>
<td>7.0</td>
<td>9.0</td>
</tr>
<tr>
<td>Clean Bay</td>
<td>Concord</td>
<td>2</td>
<td>5</td>
<td>9.0</td>
<td>11.0</td>
</tr>
<tr>
<td>Clean Seas</td>
<td>Santa Barbara</td>
<td>2</td>
<td>5</td>
<td>11.8</td>
<td>13.8</td>
</tr>
<tr>
<td>Clean Coastal Waters</td>
<td>Long Beach</td>
<td>2</td>
<td>5</td>
<td>11.8</td>
<td>13.8</td>
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</table>

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.

<table>
<thead>
<tr>
<th>EQUIPMENT OWNER</th>
<th>STORAGE LOCATION</th>
<th>ESTIMATED MOBILIZATION TIME (hours)</th>
<th>ESTIMATED TRAVEL TIME TO DUTCH HARBOR (10 knots)</th>
<th>TOTAL RESPONSE TIME (hours)</th>
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<tr>
<td></td>
<td></td>
<td>(min)</td>
<td>(max)</td>
<td>(days)</td>
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<tr>
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<td>5</td>
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<td>5</td>
<td>2</td>
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<tr>
<td></td>
<td>Anchorage</td>
<td>2</td>
<td>5</td>
<td>3</td>
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<td>Kenai</td>
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<td>Kenai</td>
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</table>

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.