Alaska Outer Continental Shelf

OCS EIS/EA
BOEM 2016-069

Cook Inlet Planning Area

Oil and Gas Lease Sale 244
In the Cook Inlet, Alaska

Final Environmental Impact Statement

Volume 2. Chapters 6-7, Appendices A-G

U.S. Department of the Interior
Bureau of Ocean Energy Management
Alaska OCS Region

December 2016

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Prepared by
Bureau of Ocean Energy Management
Alaska OCS Region

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Table of Contents

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Table of Contents

Appendix E: Estimate of Employment, Population and Fiscal Impacts OCS Sale 244

Appendix F: Response to Comments

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Chapter 6

Consultation and Coordination

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Table of Contents

List of Tables

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Chapter 6. CONSULTATION AND COORDINATION

6.1. Development of the Proposed Action and Environmental Impact Statement

On March 27, 2012, BOEM issued a RFI for Lease Sale 244 (77 *FR* 18260) to determine the level of industry interest and whether that interest is focused on a few blocks or prospects or on a larger portion of the planning area. After determining that there was sufficient interest from industry, BOEM decided to continue with the lease sale process. In August 2012, the Secretary of the Interior issued the Final OCS Oil and Gas Leasing Program for 2012-2017. That document presented USDOI's decision to schedule a lease sale in the Cook Inlet OCS Planning Area. BOEM identified the area for the proposed lease sale and issued its decision on November 27, 2013 (Orr, 2013).

6.1.1. Development of the Environmental Impact Statement

The NEPA process began with the NOI to prepare an EIS for the proposed Cook Inlet OCS Lease Sale 244, published in the Federal Register on October 23, 2014 (79 *FR* 63437), enabling BOEM to proceed with the pre-sale process. The NOI served to announce the beginning of the scoping process designed to identify issues and concerns related to the proposed lease sale. The NOI also provided information regarding the five public scoping meetings (Seldovia, Nanwalek, Homer, Soldotna, and Anchorage) held during the comment period.

The purpose of the public scoping meetings was to solicit comments on the scope of the EIS, identify issues to be analyzed, and identify possible alternatives and mitigation measures. In addition to accepting oral and written comments at meetings, BOEM accepted written comments by mail and through www.regulations.gov. The public comment period closed on December 8, 2014. BOEM received a total of 26 written comment forms. Of those, three were from Federal Government agencies, three from environmental groups, two from Alaska Native tribes or tribal associations, one from other organizations, and 17 from individuals.

Many issues and mitigating measures suggested for the previous Cook Inlet Planning Area lease sale remained relevant to this proposed lease sale. All of the information received was considered in preparing the Draft EIS. Information regarding scoping is on the BOEM Lease Sale 244 website.

The Draft EIS evaluated potential impacts from the Proposed Action and alternatives, utilizing information received during the scoping process. The Draft EIS was released to the public on July 15, 2016 through a press release and posting on the bureau's website. BOEM published the Notice of Availability in the *Federal Register* on July 22, 2016. Following issuance of the Draft EIS, BOEM, in accordance with 30 CFR 556.26, held public hearings in Anchorage, Kenai, and Homer to solicit comments on the document. An announcement of the dates, times, and locations of the public hearings was included in the Notice of Availability for the Draft EIS. In addition, a copy of the public hearing notice was included with the Draft EIS mailed to the parties listed in Section 6.4, posted on the BOEM website, and published in the Alaska Dispatch News, the Peninsula Clarion Newspaper, the Homer News, and the Homer Tribune.

BOEM's notice of availability of the Draft EIS in the *Federal Register* on July 22, 2016 (81 *FR* 47819), commenced a 45-day public review and comment period that ended September 6, 2016. During this period, BOEM held three public hearings in Anchorage, Homer, and Kenai and received 26 individual testimonies during the public hearings, and 75 comment submissions via the Federal eRulemaking Portal, http://www.regulations.gov. Two of the comment submissions were form letters with 216 and 306 form letters each, respectively. When the public comment period ended, BOEM read all comments for relevant and substantive content.

BOEM integrated the relevant and substantive information received through public comments into the Final EIS analysis and then recorded appropriate responses to all comments, and provided additional responses to public comments in the response to comments appendix (Appendix F).

6.1.2. Record of Decision

A ROD will be issued no less than 30 days after the Final EIS is made available and the notice of its availability is published in the Federal Register. The ROD will be a concise summary of the decision made based on the analysis of the alternatives presented in the Final EIS. The ROD will state the decision and rationale for the decision. The ROD also will describe the implementation of any measures intended to avoid effects from the chosen alternative. Once the ROD is published, the EIS process is considered complete.

6.2. Consultation

BOEM has engaged in a number of consultation and coordination processes with Alaska Native tribes, ANCSA Corporations, and Federal regulatory agencies regarding the proposed Lease Sale 244. Below is a brief summary of how BOEM is satisfying its responsibilities under various Federal regulatory processes and Executive Orders.

6.2.1. Tribal Consultation

Executive Order (E.O.) 13175 established regular and meaningful consultation and collaboration with tribal officials in the development of Federal policies that have tribal implications, to strengthen the United States government-to-government relationships with Indian tribes (to include Alaska Native tribes and communities) and reduce the imposition of unfunded mandates upon Indian tribes when developing Federal policies with tribal implications. The order requires the head of each agency to designate an official "with principal responsibility for the agency's implementation" of the order.

Since implementation of E.O. 13175, the USDOI has established a Tribal Consultation Policy. Secretarial Order 3317 updated the USDOI's policy on consultation with Indian tribes in compliance with E.O. 13175. In summary, Secretarial Order 3317 states that USDOl officials must demonstrate a meaningful commitment to consultation "by identifying and involving Tribal representatives in a meaningful way early in the planning process," and that consultation aims to create effective collaboration emphasizing "trust, respect, and shared responsibility...".

Consistent with E.O. 13175 and implementing USDOI directives, BOEM has met with the local Tribal Governments of Seldovia, Nanwalek, and Port Graham. Government-to-Government meetings also were held with the Seldovia Village Tribe and Nanwalek Village Tribe, and by teleconference with the Port Graham Tribal Council.

BOEM initiated Government-to-Government tribal consultations by letters (and in most cases making email and telephonic contacts) to Tribes whose members could be affected by activities related to the proposed Lease Sale, located in the following communities:

- Chickaloon
- Eklutna
- Kenai
- Soldotna
- Ninilchik
- Tyonek
- Anchorage

6.2.2. Government to ANCSA Corporation Consultation

On August 10, 2012, the USDOI issued the Policy on Consultation with ANCSA Corporations. In this policy, USDOI restated a provision of ANCSA requiring that "[t]he Director of the Office of Management and Budget [and all Federal agencies] shall hereafter consult with Alaska Native corporations on the same basis as Indian tribes under E.O. 13175." Additionally, the policy “distinguishes the Federal relationship to ANCSA corporations from the government-to-government relationship between the Federal Government and federally recognized Indian Tribes... and [states that] this Policy will not diminish in any way that relationship...” The possibility for a Cook Inlet Sale 244 requires BOEM to consult with the affected Tribes and communities (including local and regional governments) and with the ANCSA corporations.

BOEM initiated the Government-to-ANCSA corporation consultations through letters (and making email and telephonic contacts) to ANCSA corporations potentially affected by activities related to the proposed Lease Sale, including:

- English Bay Corporation
- Port Graham Corporation
- Seldovia Native Association, Incorporated
- Ninilchik Natives Association, Inc.
- Kenai Natives Association, Incorporated
- Salamatof Native Association, Incorporated
- Tyonek Native Corporation
- Chickaloon-Moose Creek Native Association, Incorporated
- Eklutna, Inc.

6.2.3. Endangered Species Act Section 7 Consultation

The Endangered Species Act (ESA; 16 U.S.C. § 1531), provides a program for the conservation of threatened and endangered plants and animals and the ecosystems on which they depend. Section 7(a)(2) of the ESA requires each Federal agency to ensure that any action that they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in the adverse modification of designated critical habitat. With respect to this proposed lease sale, BOEM is consulting with USFWS and NMFS (the “Services”) concerning potential impacts to listed species and their designated Critical Habitat. For ESA consultation on proposed lease sales in Alaska, BOEM and BSEE specifically request incremental Section 7 consultations. Regulations at 50 CFR 402.14(k) allow consultation on part of the entire action as long as that step does not violate Section 7(a)(2); there is a reasonable likelihood that the entire action will not violate Section 7(a)(2); and the agency continues consultation with respect to the entire action, obtaining a Biological Opinion for each step. Accordingly, at the lease-sale stage (see Figure 1.3.1-1 in Chapter 1 for an illustration of the four stages in OCSLA), BOEM evaluates the early lease activities (seismic surveying, ancillary activities, and exploration drilling) to ensure that activities under any leases issued will not result in jeopardy to a listed species or cause adverse modification of designated critical habitat. BOEM and BSEE would then reinitiate consultation for any proposed development and production activities.

6.2.4. Essential Fish Habitat Consultation

The Magnuson-Stevens Fishery Conservation and Management Act (as amended) requires Federal agencies to consult with NMFS regarding actions that may adversely affect designated Essential Fish Habitat (EFH). EFH designations were updated for five species of Pacific salmon (Chinook, coho, pink, sockeye, and chum salmon) in the June 2012 NMFS Fishery Management Plan (FMP). In the February 2014 NMFS FMP, EFH was described for weathervane scallops. NMFS EFH designations for groundfish in the Gulf of Alaska were revised in August 2015. That revised FMP includes EFH for Pacific cod, walleye pollock, arrowtooth flounder, rock sole, sculpins, and skates. BOEM prepared an EFH assessment that identified adverse effects to designated EFH from potential oil and gas exploration activities in the proposed Lease Sale Area. This assessment was provided to and accepted by NMFS prior to releasing the Final EIS.

6.2.5. Section 106, National Historic Preservation Act Consultation

Section 106 of the NHPA (36 CFR part 800), "Protection of Historic Properties," as amended through 2004, requires that Federal agencies having direct or indirect jurisdiction over a proposed Federal, federally assisted, or federally licensed undertaking, prior to approval of the expenditure of funds or the issuance of a license, take into account the effect of the undertaking on any district, site, building, structure, or object included in or eligible for inclusion in the National Register of Historic Places (NRHP). The Advisory Council on Historic Preservation (ACHP), which administers Section 106, has issued regulations (36 CFR part 800) defining how Federal agencies are to meet the statutory responsibilities. The head of a Federal agency shall afford the ACHP a reasonable opportunity to review and comment on an action.

BOEM and BSEE have instituted procedures to optimize the likelihood that authorized OCS activities contribute to the preservation and enhancement of historic properties and archaeological resources. BOEM and BSEE have published guidelines (NTL 2000-A03 (superseded by NTL 2005-A03)) for performing archaeological surveys on the Alaskan OCS.

BOEM recognizes that a lease sale constitutes an undertaking under Sec.106 of the NHPA but is not the type of activity that has the potential to cause effects on historic properties, and thus would not require formal SHPO consultation. Subsequent project- and site-specific consultations will occur if they are a type of activity that has the potential to cause effects on historic properties for any proposed exploration, development, and production activities.

6.2.6. Coastal Zone Management Act Consistency

The federally approved Alaska Coastal Management Program (ACMP) expired on June 30, 2011. Consequently, Federal agencies are not required to provide the State of Alaska with CZMA Consistency Determinations or Negative Determinations pursuant to 16 U.S.C. § 1456(c)(1) and (2), and 15 CFR part 930, subpart C (76 *FR* 39857, July 7, 2011).

6.2.7. Marine Mammal Protection Act

All oil and gas activities described in the EIS Scenario must comply with the Marine Mammal Protection Act (MMPA). The MMPA prohibits the unauthorized "take" of marine mammals. Under the MMPA and regulations promulgated by NMFS and USFWS (collectively, the "Services"), "take" is defined broadly to include not only "serious injury" or mortality, but also "harassment." The Services may authorize "take" of marine mammals where certain criteria are met. Specifically, the taking must:

- Be of small numbers of marine mammals
- Have no more than a "negligible impact" on those marine mammal species or stocks
- Not have an "immitigable adverse impact on the availability of the species or stock for "subsistence" uses

6.3. Cooperating Agencies

BOEM is the lead agency for the preparation of this EIS. Following the guidelines at 40 CFR 1501.6 and 1508.5 from the CEQ, BOEM invited qualified government entities to become cooperating agencies for the preparation of the proposed Lease Sale 244 EIS. The National Park Service (NPS) participated as a formal cooperating agency on the Draft EIS. Other key agencies that provided input included the Bureau of Safety and Environmental Enforcement (BSEE), the National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS), U.S. Army Corps of Engineers (USACE), U.S. Coast Guard (USCG), U.S. Environmental Protection Agency (USEPA), and the State of Alaska's Governor's office.

6.4. Distribution of the Draft Environmental Impact Statement

The following is a list of Federal, State, Tribal, and local government agencies; academic institutions; members of the oil and gas industry, corporations, other organizations, and libraries who received a printed or CD copy of the Draft EIS (Table 6-1). All others on BOEM's mailing list were notified by a post card regarding how to obtain a copy.

Table 6-1. Organizations, Entities, and Individuals Who Received Physical Copies of the Draft EIS.

Entity	List of Those Who Received Physical Copies of the Draft EIS
Federal - Executive Branch	• Bureau of Indian Affairs - Regional Director, Anchorage • Bureau of Land Management - Alaska State Director; Anchorage District Office • Bureau of Ocean Energy Management - Regional Directors for the Gulf of Mexico and Pacific OCS Region • Bureau of Safety & Environmental Enforcement - Regional Director, Alaska; Environmental Enforcement Division, Anchorage AK • Department of Commerce - National Oceanic and Atmospheric Administration; National Marine Fisheries Service - Alaska Regional Office, Regional Administrator; Resource Ecology & Fisheries Mgmt; National Ocean Service, Policy, Planning & Analysis Division; Office of Response & Restoration; Scientific Support Coordinator for Alaska; NEPA Coordination & Compliance; Alaska Fisheries Science Center - National Marine Mammal Lab; Emergency Response Division; Auke Bay Laboratory • Department of Defense - US Army Corps of Engineers • Department of Homeland Security - US Coast Guard, Anchorage, AK • Department of the Interior - Office of Environmental Policy & Compliance, Anchorage, AK; Special Assistant to the Secretary of the Interior, Anchorage, AK • National Park Service - Regional Director; Superintendent, Katmai National Park and Preserve • US Geological Survey - Regional Director; Director, Alaska Science Center • US Fish & Wildlife Service – Headquarters; Director, Region 7; Chief, Endangered Species Branch; Assistant Regional Director, Subsistence, and Fisheries and Habitat Conservation; Migratory Bird Management, Endangered Species Branch; Kodiak National Wildlife Refuge
Federal - Legislative Branch	• Honorable Daniel Sullivan, Senator • Honorable Lisa Murkowski, Senator • Honorable Don Young, House Representative
Federal - Administrative Agencies and Other Agencies	• Environmental Protection Agency - Alaska Operations Office • North Pacific Fisheries Management Council • Marine Mammal Commission
State of Alaska	• Office of the Governor, Juneau, AK; Policy Director, Special Counsel Associate Director State-Federal Relations, Washington, DC; Office of Management and Budget, Division of Governmental Coordination • Dept of Community & Regional Affairs – Commissioner • Dept Of Environmental Conservation - Northern Alaska District Office; Division of Water; Anchorage District Office • Dept of Fish & Game - Wildlife Conservation Division; Subsistence Division; Region II, H & R Chief; Division of Sport Fish • Dept of Natural Resources - Commissioner; Office of Project Management & Permitting; Director, Division of Oil & Gas; Citizens' Advisory Commission on Federal Areas • State Pipeline Coordinator, Joint Pipeline Office, Anchorage, AK

Entity	List of Those Who Received Physical Copies of the Draft EIS
Tribal Governments	• Native Village of Chickaloon • Native Village of Kenaitze • Native Village of Knik • Native Village of Nanwalek • Native Village of Ninilchik • Native Village of Port Graham • Native Village of Seldovia • Native Village of Tyonek
Alaska Native Associations	• Alaska Federation of Natives • Cook Inlet Tribal Council • Ninilchik Traditional Council • Seldovia Native Association, Inc.
Alaska Native Claims Settlement Act Corporations	• Afognak Native Corporation • Chugach Alaska Corporation • Chugach Development Corporation • Chugachmuit • Cook Inlet Regional Corporation • English Bay Native Corporation • Koniag, Inc. • Ouzinkie Native Corporation • Port Graham Corporation • Tyonek Native Corporation
Local Governments	• Anchor Point Chamber of Commerce • City of Homer • City of Kachemak • City of Kenai • City of Seldovia • Kenai Peninsula Borough • Ninilchik Chamber of Commerce

6.5. Preparers, Reviewers and Supporting Staff

Table 6.-2 lists the primary individuals involved, their professional position, and their role in preparing and/or reviewing the EIS.

Table 6-2. List of the Primary Individuals Contributing to Development and Analysis in the EIS.

Name	Organization	Education/Expertise	Contribution
William R. Sloger, Jr.	CSA Ocean Sciences Inc.	M.S., Environmental Studies; M.S., Civil Engineering; B.S., Civil Engineering; 25 years of experience	Project Manager, Co-Author Chapters 1, 3, 4, and 6
Robert (Bo) Douglas	CSA Ocean Sciences Inc.	B.S., Civil Engineering; B.S., Marine Biology; 25 years of experience	Deputy Project Manager, Co-Author Chapters 2 and 3
Neal Phillips	CSA Ocean Sciences Inc.	Ph.D., Ecology; M.S., Marine Studies; B.A., Biological Sciences; 38 years of experience	Author Chapter 2, Co-Author Chapter 5, Science Editor
John Tiggelaar	CSA Ocean Sciences Inc.	M.S., Biology; B.A., Biology; 7 years of experience	Co-Author Chapters 2, 4, and 5, Science Editor
Jodi Harney	CSA Ocean Sciences Inc.	Ph.D., Geology and Geophysics; M.S., Marine Science; B.S., Biology; 20 years of experience	OSRA/Spill Coordinator, Chapter 5 Co-Author, Science Editor
Mary Jo Barkaszi	CSA Ocean Sciences Inc.	M.S., Biological Oceanography; B.S., Biology; 29 years of experience	Co-Author Chapters 3, 4, and 5 (Marine Acoustics)
Jeff Martin	CSA Ocean Sciences Inc.	B.S., Applied Mathematics; 5 years of experience	Project Data Management, Science Editor
Brian Balcom	CSA Ocean Sciences Inc.	M.S., Biology; B.S., Biological Sciences; 39 years of experience	Science Editor
Robert B. Cady	CSA Ocean Sciences Inc.	M.S., Oceanography; B.S., Marine Biology; 15 years of experience	Co-Author Chapters 3, 4, and 5 (Marine and Coastal Birds, Lower Trophic Organisms)

Name	Organization	Education/Expertise	Contribution
Tony Martin	CSA Ocean Sciences Inc.	M.S., Biology; B.S., Marine Biology; 22 years of experience	Co-Author Chapters 3, 4, and 5 (Areas of Special Concern), Science Editor
Ben Harkanson	CSA Ocean Sciences Inc.	M.S., Marine Biology; B.S., Biology; 16 years of experience	Co-Author Chapters 3, 4, and 5 (Terrestrial Mammals)
Kim Olsen	CSA Ocean Sciences Inc.	B.S., Oceanographic Technology; 31 years of experience	Science Editor
David B. Snyder	CSA Ocean Sciences Inc.	M.S., Marine Biology and Ichthyology; B.S., Zoology; 27 years of experience	Author, EFH
Patrick W. Connelly	CSA Ocean Sciences Inc.	M.S., Biology; B.A., Biology; 12 years of experience	Co-Author Chapter 3 (Areas of Special Concern)
Mark S. Fonseca	CSA Ocean Sciences Inc.	Ph.D., Integrative Biology; M.S., Environmental Sciences; B.S., Resource Development; 38 years of experience	Science Editor
Jeffrey Landgraf	CSA Ocean Sciences Inc.	M.S., Marine Biology; B.S., Marine and Field Biology; 13 years of experience	Co-Author Chapter 5
Ashley A. Pittman	CSA Ocean Sciences Inc.	B.S., Marine Biology; B.S., Anthropology; 5 years of experience	Biological Assessment
Virginia DeLong	CSA Ocean Sciences Inc.	20 years of experience	Appendix E, Literature Cited
John Thompson	CSA Ocean Sciences Inc.	M.S., Marine Biology; B.S., Biology; 41 years of experience	Co-Author Chapter 3 (Water Quality, Physiography, Bathymetry, and Geology, and Public and Community Health)
Eddie Hughes	CSA Ocean Sciences Inc.	M.S., Oceanography: 21 years experience	Co-Author Chapters 3, 4, and 5 (Public and Community Health)
Kristen L. Metzger	CSA Ocean Sciences Inc.	M.A., Library and Information Science; B.A., Library Science/Education; 40 years of experience	Administrative Record, Librarian
Melanie L. Cahill	CSA Ocean Sciences Inc.	B.S., Marine Sciences; 10 years of experience	Data Management, Document Management
Stephanie Urquhart	CSA Ocean Sciences Inc.	5 years of experience	Support Services Manager
Deborah Murray	CSA Ocean Sciences Inc.	5 years of experience	Document Processor
Tammy Johnson	CSA Ocean Sciences Inc.	1 year of experience	Document Processor
Kim Dunleavy	CSA Ocean Sciences Inc.	A.A.S., Electrical Engineering; 26 years of experience	Technical Editor
Sarah Franklin	CSA Ocean Sciences Inc.	M.A., Geography; M.S., Natural Resources Ecology & Management; B.S., Ecology; 9 years of related experience, GISP	GIS Analyst
Brent Gore	CSA Ocean Sciences Inc.	M.A., Geography; B.A., Geography; 7 years of experience	GIS Technician
Brian Diunizio	CSA Ocean Sciences Inc.	B.S., Biology; 2 years of related experience	GIS Technician
Dustin Myers	CSA Ocean Sciences Inc.	B.S., Marine Biology; 2 years of related experience	GIS Technician
Raymond Tubby	Southeastern Archaeological Research, Inc. (SEARCH)	M.A., Maritime History; B.A., Anthropology; 14 years of experience	Co-Author Chapters 3, 4, and 5 (Archaeological Resources)

Name	Organization	Education/Expertise	Contribution
Leah Colombo	Southeastern Archaeological Research, Inc. (SEARCH)	M.A. Maritime Archaeology, B.A. Marine Geology; 7 years of experience	Co-author Chapter 3 (Archaeological Resources)
Mike Feinblatt	ESS Group, Inc.	B.S., Mechanical Engineering; 24 years of experience	Co-Author Chapters 3, 4, and 5 (Air Quality), Appendix C
Gordon Perkins	ESS Group, Inc.	B.L.A., Landscape Architecture, A.A.; 15 years of experience	Co-Author Chapters 3, 4, and 5 (Visual Resources)
Mike Ernsting	ESS Group, Inc.	B.S., Environmental Engineering; 4 years of experience	Co-Author Chapters 3, 4, and 5 (Air Quality), and Appendix C
John Purdum	ESS Group, Inc.	B.S., Meteorology; 33 years of experience	Co-Author Appendix C
Frank Marcinkowski	PCCI	Graduate Studies in Ocean Sciences; B.S. in Chemical Engineering; Over 30 years of experience in all aspects of environmental and regulatory support	Co-Author Chapters 3, 4, and 5 (Oil and Gas Infrastructure)
Justin Wilson	PCCI	B.S. in Environmental and Agricultural Sciences; 16 years of experience	Co-Author Chapters 3, 4, and 5 (Oil and Gas Infrastructure)
David Cameron	Owl Ridge Natural Resources Consultants	B.A. Biology; M.S. Terrestrial Ecology; 36 years of experience	Co-Author Chapters 3, 4, and 5 (Economy and Population, and Recreation and Tourism)
Michael Stanwood	Owl Ridge Natural Resources Consultants	M.S. Mineral Economics; B.A. Psychology; 41 years of experience	Co-Author Chapters 3, 4, and 5 (Economy and Population)
Glen Ruckhaus	Owl Ridge Natural Resources Consultants	B.A. Geology; 33 years of experience	Review/QA/QC Chapters 3, 4, and 5 (Economy and Population, and Recreation and Tourism)
Roger Marks	Owl Ridge Natural Resources Consultants	B.S. Financial Economics; B.A. Accounting; 38 years as a petroleum economist	Co-Author Chapters 3, 4, and 5 (Economy and Population)
Richard Stern	Northern Land Use Research Alaska	Ph.D. Anthropology; M.A. Anthropology; B.A. Anthropology; 30 years of experience	Co-Author Chapters 3, 4, and 5 (Subsistence Harvest Patterns and Sociocultural Resources)
Jason Rodgers	Northern Land Use Research Alaska	Ph.D. Archaeology; M.A. Marine Archaeology; 15 years of experience	Co-Author Chapters 3, 4, and 5 (Archaeological Resources)
Jan Brandt	48 North Solutions	M.S., Urban and Regional Planning; 19 years of experience	Co-Author Chapters 3, 4, and 5 (Fish and Shellfish, Commercial Fishing, Sport Fishing)
Cam Fisher	48 North Solutions	M.S., Marine Science; 17 years of experience	Co-Author Chapters 3, 4, and 5 (Fish and Shellfish, Commercial Fishing, Sport Fishing)
Bruce Mavros	48 North Solutions	M.Sc., Zoology; 26 years of experience	Co-Author Chapters 3, 4, and 5 (Fish and Shellfish, Commercial Fishing, Sport Fishing)

Name	Organization	Education/Expertise	Contribution
Jen Dushane Garner	Alaska Ecological Resources	Ph.D. Student Marine Biology; 9 years of experience	Co-author Chapters 3, 4, and 5 (Marine Mammals, Coastal and Estuarine Habitats)
Willow Hetrick	Alaska Ecological Resources	M.S., Natural Resources and Environmental Management; 7 years of experience	Co-author Chapters 3, 4, and 5 (Marine Mammals, Coastal and Estuarine Habitats)
Ann Isley	Independent Individual Contractor	Ph.D., Oceanography; M.S., Oceanography; B.S., Geosciences and Modern Languages; 31 years of experience	Co-author Chapters, 3, 4, and 5 (Water Quality, Geology), Technical Editor
Luis M. Lagera, Jr.	Independent Individual Contractor	Ph.D., Environmental Sciences (Ecology); M.S., Biological Sciences; B.S., Zoology; 20 years of experience	Chapters 3, 4, and 5 (Physiography, Bathymetry, Geology and Public and Community Health) and Chapter 5 (Water Quality), Science Editor
Pam Jones	Independent Individual Contractor	B.S., Business Administration; 15 years of experience	Technical Editor
Natalie C. Kraft	Independent Individual Contractor	M.E.M., Coastal Environmental Management; B.S., Marine Science/Biology; 5 years of experience	Technical Editor
Gene Augustine	BOEM	Interdisciplinary Biologist	Water Quality, Coastal and Estuarine Habitats
Susan Banet	BOEM	Chief, Resource Analysis Section	E&D Scenario Development
Jerry Brian	BOEM	Socioeconomic Specialist	Economics
Jeffrey Brooks	BOEM	Sociocultural Specialist	Sociocultural Systems, Economy and Population, Subsistence Harvest Patterns, Public and Community Health, Environmental Justice, Recreation, Tourism, and Visual Resources, Sport and Commercial Fishing, Areas of Special Concern
Chris Campbell	BOEM	Sociocultural Specialist	Archaeology
Chris Crews	BOEM	Wildlife Biologist	Marine and Terrestrial Mammals, and Acoustic Environment
Lorena Edenfield	BOEM	Fisheries Biologist	Fish, Shellfish, and Lower Trophic Organisms; EFH Consultation
Maureen deZeeuw	BOEM	Wildlife Biologist	Birds
Melanie Hunter	BOEM	NEPA Coordinator	Review
Betty Lau	BOEM	Chief, Resource & Economic Analysis Section	E&D Scenario Development
Carla Langley	BOEM	Mineral Leasing Specialist	GIS Map Production
Michael Lu	BOEM	Petroleum Engineer	E&D Scenario Development
Frances Mann	BOEM	Chief, Environmental Analysis Section II	Review
Virgilio Maisonet-Montanez	BOEM	Meteorologist	Air Quality and Oceanography

Name	Organization	Education/Expertise	Contribution
Caron McKee	BOEM	Technical Writer/Editor	Project Manager, Document Preparation
Justin Miller	BOEM	Petroleum Engineer	Response to Comments
Bridget Psarianos	BOEM	Program Analysis Officer	Climate Change
Sharon Randall	BOEM	Chief, Environmental Analysis Section I	Review
Virginia Raps	BOEM	Meteorologist	Climate and Air Quality
Jill Marie Seymour	BOEM	Wildlife Biologist	Marine Mammals
Caryn Smith	BOEM	Oceanographer	Sea Ice, Hydrocarbon Release Scenarios
William Swears	BOEM	Technical Writer/Editor	Document Preparation, Cumulative Case

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APPENDIX A

Accidental Spills (Oil Spills and Gas Releases Information, Models and Estimates)

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Appendix A. Accidental Oil Spills and Gas Releases

Table of Contents

Lists of Figures, Tables, and Maps

List of Figures

A.1-Supporting Tables and Maps

List of Maps

A.2-OSRA Conditional and Combined Probability Tables

Tables A.2-1 through A.2-5 represent annual conditional probabilities (expressed as percent chance) that a large oil spill starting at a particular location will contact a certain environmental resource area (ERA) within:

Tables A.2-36 through A.2-40 represent summer conditional probabilities (expressed as percent chance) that a large oil spill starting at a particular location will contact a certain boundary segment within:

Tables A.2-41 through A.2-45 represent winter conditional probabilities (expressed as percent chance) that a large oil spill starting at a particular location will contact a certain environmental resource area within:

Tables A.2-46 through A.2-50 represent winter conditional probabilities (expressed as percent chance) that a large oil spill starting at a particular location will contact a certain land segment within:

Tables A.2-51 through A.2-55 represent winter conditional probabilities (expressed as percent chance) that a large oil spill starting at a particular location will contact a certain group of land segments within:

Tables A.2-56 through A.2-60 represent winter conditional probabilities (expressed as percent chance) that a large oil spill starting at a particular location will contact a certain boundary segment within:

Tables A.2-61through A.2-64 represent combined probabilities (expressed as percent chance), over the assumed life of the Lease Sale 244 Action Area, Alternatives 1, 3a, 3b, 3c, 4a, 4b, 5, or 6, of one or more spills ≥1,000 bbl, and the estimated number of spills (mean), occurring and contacting a certain:

Accidental Oil Spills and Gas Releases: Information, Models, and Estimates

BOEM analyzes hypothetical oil spills and gas releases from oil and gas activities and their relative impact to environmental, economic, and sociocultural resources and resource areas and the coastline. Each of these hypothetical spills or releases has varying potential to result from outer continental shelf (OCS) oil and gas exploration, development and production in the Lease Sale 244 Action Area. BOEM makes a set of assumptions that collectively form an oil spill and gas release scenario. This consistent set of scenario information is used to formulate the potential oil spill and gas release effects from oil and gas activities in a consistent and logical manner throughout Chapters 4 and 5 of this EIS.

It is not anticipated that oil spills occur as a routine activity. Therefore, oil spills are not considered a routine impact-producing factor (IPF). Oil spills are considered accidental events, and the Clean Water Act and the Oil Pollution Act include both regulatory and liability provisions that are designed to reduce damage to natural resources from oil spills. Therefore, oil spills are treated as an accidental IPF. An accident is an unplanned event or sequence of events that results in an undesirable consequence. In this analysis the undesirable consequence is an oil spill or gas release in the environment.

This Appendix discusses the technical information used to develop the set of assumptions for purposes of oil spill or gas release analysis over the entire life of the exploration and development scenario (Scenario). The information about these accidental oil spills or gas releases includes estimates of the:

- Sources of accidental spills or gas releases that may occur
- Number of spills or releases that may occur and their chance of occurring
- Spill sizes
- Weathering and fate of spills
- Offshore locations to which large spills might travel due to the effects of winds, currents and ice
- Duration of large spill travel
- Length of coastline affected by large offshore spills
- Likelihood of one or more offshore large spills occurring and contacting locations of environmental, social or economic resources or resources areas

Oil spills are divided into two general activity categories and two general spill-size categories. These divisions reflect a difference in the ways information about the spills is derived and used. The two general activity categories considered in oil-spill analysis are:

- Exploration and delineation
- Development, production, and decommissioning

The two general spill-size categories considered in oil-spill analysis are:

- Small spills, those less than less than (<) 1,000 barrels (bbl)
- Large spills, those greater than or equal to (≥) 1,000 bbl, meaning that 1,000 bbl is the minimum threshold size for a large spill
  - A subset of large oil spills is called very large oil spills (VLOS), which are spills (≥) 120,000 bbl.

A small spill (<1,000 bbl) would not be expected to persist on the water long enough for the model to follow its path in a trajectory analysis. Therefore, for small spills, BOEM estimates the type of oil and the number and size of spill(s).

Large spills are those spills that are ≥1,000 bbl and would persist on the water long enough for the model to follow its path in a trajectory analysis. To judge the effect of a large oil spill, BOEM estimates the general source(s) of a large oil spill (such as a pipeline, platform or well), the location and size of the spill, the type and chemistry of the oil, how the oil will weather (naturally degrade in the environment), how long it will remain prior to naturally degrading, and where it may go. BOEM also estimates the mean number of large spills and the chance of one or more large spills occurring over the life of the Scenario. BOEM simulates the paths (trajectories) that large oil spills could take to estimate the chance of a large spill contacting a specific portion of shoreline or offshore resource area. BOEM then combines the chance of a spill contacting a portion of shoreline or resource area with the chance of one or more large spills occurring at all to estimate the chance of one or more large spills both occurring and contacting a shoreline or offshore resource area over the life of the Scenario.

Estimating large oil-spill occurrence or large oil-spill contact is an exercise in mathematical probabilities. Uncertainty exists regarding whether exploration or development will occur at all and, if it does, the location, number, and size of potential large oil spill(s) and the wind, ice, and current conditions at the time of a spill(s). Although some of the uncertainty reflects incomplete or imperfect data, a considerable amount of uncertainty exists simply because it is difficult to predict events 40 years into the future.

A VLOS is analyzed separately from large oil spills due to its lower level of probability. The technical analysis of a VLOS event is meant to assist BOEM and the Secretary of the Interior in evaluating low-probability, high-impact events. The scenario and impacts discussed for a VLOS analysis should not be confused with the scenario and impacts anticipated to result from routine activities or from accidental events related to the Proposed Action or its alternatives. This is due to the very low mathematical frequency associated with VLOS events.

In the following subsections, BOEM describes the rationale for the assumptions used in oil-spill analyses, which combine project-specific information, modeling results, statistical analysis, four decades of experience modeling hypothetical oil spills, and professional judgment. The information, models, and assumptions about large spills are discussed in Sections A-1 through A-4. Small spills are discussed in Section A-5. Gas releases and a VLOS are discussed in Section A-6 and Section A-7, respectively.

A-1. Accidental OCS Large Oil Spills

The following discussion provides the context for the sources of oil in the sea. With the exception of rare events like the Deepwater Horizon (DWH), discharges of oil in the sea have declined over the years, even as petroleum consumption has increased (USCG, 2012a, b; USEIA, 2014). Possible causes for the decline in oil discharges include passage of the Oil Pollution Act of 1990 (OPA 90), technology improvements, and implementation of safety-management systems that implement practical risk-reduction interventions.

Between 1971 and 2013, Outer Continental Shelf (OCS) operators produced almost 18 billion barrels (Bbbl) of oil. During this period (excluding the DWH spill which is a rare event) there were 2,844 spills ≥1 barrel that totaled approximately 174,000 bbl spilled. This equals 0.001% of the total bbl of oil produced during that period, or about 1 barrel spilled for every 103,200 bbl produced. This record has improved over time. During the more recent period between 1999 and 2013, almost 8.0 Bbbl of oil were produced and there were 645 spills that totaled approximately 39,000 bbl spilled. This is equal to 0.0005% of the total of bbl of oil produced, or approximately 1 barrel spilled for every 204,700 bbl produced. For typical OCS oil spills, the record of OCS oil spills into the environment is improving.

The inclusion of rare events like the DWH spill in the record requires sophisticated analysis due to the small number of events. The U.S. Coast Guard (USCG) noted that the DWH volume is 86% of all discharges by volume recorded for U.S. waters in the preceding 37 years (USCG, 2012b), ending in 2009. These rare events are small in number and are not well handled using standard statistics such as average probabilities. Several recent papers and analyses have identified various methods for estimating the frequency of these rare events (Abimbola, Khan and Khakzad, 2014; Ji, Johnson, and

Wikel, 2014; Khakzad, Khan, and Paltrinieri, 2014; USDOI, BOEM, 2016; Figure 3.3-1). The mathematical analysis of very large spills, like the DWH spill, is detailed in Section A.1.2.3.

A-1.1. Large Spill Size, Source, and Oil-Type Assumptions

Table A.1-1 shows the general size categories, source of a large spill(s), type of oil, size of spill(s) in bbl, and the total volume BOEM assumes in the analysis of oil-spill effects in Chapter 4 of this EIS for the Lease Sale 244, Alternatives 1, 3a, 3b, 3c, 4, 5, or 6.

A-1.2. OCS Large Oil-Spill Sizes

Large OCS spills have a minimum size, or threshold value, of 1,000 bbl, but the spill size could be larger. Table A.1-1 shows the assumed large spill sizes used in the effects analysis of a large OCS spill for the Lease Sale 244 Action Area.

The large OCS spill-size assumptions BOEM uses are based on reported spills in the Gulf of Mexico and Pacific OCS because no large spills (≥1,000 bbl) have occurred on the Alaska or Atlantic OCS from oil and gas activities. BOEM uses the median OCS spill size as the likely large spill size (Anderson, Mayes, and LaBelle, 2012) because it is the most probable size for that spill-size category. The Gulf of Mexico and Pacific OCS data show that a large spill most likely would be from a pipeline or a platform. The median size of a crude oil spill ≥1,000 bbl from a pipeline on the OCS over the last 15 years is 1,720 bbl, and the average is 2,771 bbl (Anderson, Mayes, and LaBelle, 2012). The median spill size for a platform on the OCS over the entire record from 1964-2010, is 5,066 bbl, and the average is 395,500 bbl (Anderson, Mayes, and LaBelle, 2012). As previously discussed, outliers such as the DWH spill volume skew the average and the average is not a useful statistical measure. For purposes of this analysis, BOEM uses the median spill size, rounded to the nearest hundred shown below, as the likely large spill sizes for purposes of analysis:

	OCS Pipeline	OCS Platform
Assumed Large Spill Size (bbl)	1,700	5,100

A-1.2.1. Source and Type of Large Oil Spills

The source is considered the place from which a large oil spill could originate. For Cook Inlet, the sources of large spills are divided generically into production platforms, wells, and pipelines (Anderson, Mayes, and LaBelle, 2012). The places where a large spill could occur are based on the Exploration and Development Scenario (Section 2.4). Platform sources include spills from wells or from diesel fuel tanks located on platforms. Large offshore pipeline spills include spills from the riser and from the offshore pipeline to the shore. Large onshore pipeline spills include spills from shore to the processing facilities or distribution centers.

The types of oil spilled from platform spills are assumed to be crude oil or diesel oil. Large oil pipeline spills are assumed to be crude oil.

Crude oils vary in properties and crude oil spills behave in different ways based on their properties. A medium crude oil similar to crude oils representative of Trading Bay within the Cook Inlet Region is used for this analysis. Crude oil samples recovered from wells within Cook Inlet State waters are characterized by a range of American Petroleum Institute (API) gravity, which is a measure of how heavy or light the oil is compared to water. The crude oils in the Cook Inlet Region are estimated to range from API gravities of 20 to 40^{o}. Given the existing information from crude oil samples recovered from Alaska state wells, BOEM chose the lower end of the range of API gravities which generally weather and degrade more slowly than higher API gravities.

A-1.2.2. Onshore Large Oil Pipeline Spills

Epstein (2002) looked at oil and gas pipeline data in the Cook Inlet watershed from 1997-2001. Epstein (2002) contains final volumes that are not included in the State of Alaska, Department of Environmental Conservation (2002a) database of initial reports. No onshore pipeline crude oil spills ≥1,000 bbl occurred during this time. There is one crude and produced water spill reported ≥1,000 bbl. Unocal's estimate of the total volume of produced fluids discharged is 228,648 gallons (5,444 bbl). Of this total volume, Unocal has estimated that approximately 95% was produced water (217,224 gallons; 5,172 bbl) and 5% was crude oil (11,424 gallons; 272 bbl) (State of Alaska, Dept. of Environmental Conservation, 1999). The Sienkiewicz and Wondzell (1992) report was deemed relatively reliable for offshore spills, but lack of reported onshore spills suggests missing data. The small number of large spills and the quality of the data make the Cook Inlet data unsuitable for quantitative estimates of spill size or frequency for large onshore spills for the entire duration of production (1957-2015).

The U.S. Department of Transportation (USDOT), Office of Pipeline Safety Research and Special Programs Administration keeps information about distribution and transmission accident and incident data online (USDOT, 2015a, b, c). The Hazardous Liquid Accident Data (2004-2013) was analyzed to estimate crude-oil spills ≥1,000 bbl for onshore pipelines. The Pipeline and Hazardous Materials Safety Administration (PHMSA) hazardous liquid incident database covering a fixed period of time was filtered by commodity type and spill volume to obtain a subset of data specific to crude oil pipeline systems. Summary statistics were generated for the 74 crude oil spills ≥1,000 bbl identified. The median crude oil-spill size is 2,540 bbl and the average is 5,325 bbl. For purposes of analysis, BOEM uses the median spill size as the likely spill size for the analysis of large onshore transmission pipeline spills adjacent to the Cook Inlet OCS. The spill size is rounded to the nearest hundred, resulting in an estimate of 2,500 bbl for an onshore pipeline spill.

A-1.2.3. Historical Loss of Well-Control Incidents on the OCS, North Sea, and Cook Inlet

USDOI, BOEMRE (2011; Appendix B; Table B-1), USDOI, BOEM, (2016; Figure 3.4-1), Bureau of Land Management (USDOI, BLM)(2012; Appendix G), IAOGP (2010), Bercha Group Inc. (2014a) and Ji, Johnson, and Wikel (2014) detail the loss of well control (LOWC) incidents on the OCS and/or North Sea, and discuss the analysis of their frequencies. The loss of well control occurrence frequencies, per well, are on the order of 10^{-3} to 10^{-6}. The occurrence frequencies depend upon the operation or activity, whether the LOWC was a blowout or well release, and whether there was oil spilled.

In general, historical data show that LOWC events escalating into blowouts and resulting in oil spills are infrequent and that those resulting in large accidental oil spills are even rarer events (Anderson, Mayes, and LaBelle, 2012; Bercha, 2014a, Izon et al. 2007, Ji, Johnson, and Wikel, 2014; Robertson et al., 2013; USDOI, BOEMRE, 2011a; USDOI, BOEM, 2016). From 1964 to 2010 there were 283 well control incidents, 61 of which resulted in crude or condensate spills (USDOI, BOEM, 2012a; Table 4.3.3 1). From 1971 to 2010, fewer than 50 well control incidents occurred. Excluding the volume from the DWH spill, the total spilled volume was less than 2,000 bbl of crude or condensate. The largest of the 1971-2010 spills—other than the DWH event—being 350 bbl. The DWH event was the only VLOS to occur between 1971 and 2010 (USDOI, BOEM, 2012a). During that same time period, more than 41,800 wells were drilled on the OCS and almost 16 Bbbl of oil were produced.

Few exploration wells involve LOWC incidents and even fewer result in a spill. From 1971-2010 Industry drilled 223 exploration wells in the Pacific OCS, 46 in the Atlantic OCS, 15,138 in the Gulf of Mexico OCS, and 84 in the Alaska OCS, for a total of 15,491 exploration wells. During this period, there were 77 well control incidents associated with exploration drilling. Of those 77 well control incidents, 14 (18%) resulted in oil spills ranging from 0.5 bbl to 200 bbl, for a total 354 bbl, excluding the estimated volume from the DWH spill. These statistics show that, while approximately 15,000 exploration wells were drilled, there were a total of 15 loss-of-well-control events that resulted in a spill of any size: 14 were small spills and one was a large spill (≥1,000 bbl) that resulted from a blowout. That one large/very large spill was the DWH.

The Norwegian SINTEF Offshore Blowout Database, where risk-comparable drilling operations are analyzed and where worldwide offshore oil and gas blowouts are tracked, supports the conclusion that blowouts are rare events (IAOGP, 2010; DNV, 2010a, b; DNV, 2011). Blowout frequency analyses of the SINTEF database suggest that the highest risk operations are associated with exploration drilling in high–pressure, high-temperature conditions (DNV, 2010a, b; DNV, 2011) that are not expected to occur in the Cook Inlet Planning Area. However, as the 2010 DWH spill illustrates, there is a very small chance for a very large oil spill to occur and to result in unacceptable impacts (USCSB, 2014).

The risk of an unlikely or rare event, such as a loss of well control incident, is determined using the best available historical data. The 2012-2017 Five-Year Program Final PEIS (USDOI, BOEM, 2012a) provides a detailed discussion of the OCS well control incidents and risk factors that could contribute to a long duration LOWC. Risk factors include geologic formation and hazards; water depth and hazards, geographic location (including water depth); well design and integrity; loss of well control prevention and intervention; scale and expansion; human error; containment capability; response capability; oil types and weathering/fate; and specific regional geographic considerations, including oceanography and meteorology.

Quantifying the frequency of VLOSs from a loss of well control event is challenging as relatively few large oil spills that can serve as benchmarks have occurred on the OCS (Scarlett et al., 2011). Based on an analysis of this historic data from both the 1971-2010 (the modern regulatory era) and the 1964-1971 time frames, the frequency of a loss of well control occurring and resulting in a VLOS of different volumes was determined (USDOI, BOEM, 2016, Figure 3.4-1). This analysis, which is set forth in the 2017-2022 Five-Year Program PEIS, was used to calculate the frequency (per well) of a spill exceeding 120,000 bbl, which is the VLOS volume assumed for the purpose of analysis in this EIS. This frequency was determined to be $>10^{-4} - <10^{-5}$ (USDOI, BOEM, 2016, Figure 3.4-1).

The record for Cook Inlet blowouts is not validated but is presented as the best available information based on newspaper accounts and other available information. No oil spills due to blowouts were identified in either the spill data or the newspaper accounts. A minimum and perhaps a maximum of eight natural gas blowouts occurred in Cook Inlet. The following identifies the eight gas blowouts:

Table A- 1. Reports of Natural Gas Well Blowouts.

Date Start Date End	Location	Company	Well Name	Well Type	Medium	Kill Method	Notes	Sources
1962	Onshore		Beluga River 212-35	Development	Natural Gas			ADN, 2008
6/10/-7/24/1962	Offshore Middle Ground Shoal	Pan American Petroleum Corp.	Cook Inlet State No. 1	Exploration	Natural Gas			ADN, 2008, AOGCC, 2010
8/23/-10/23/1963	Offshore Middle Ground Shoal	Pan American Petroleum Corporation	Cook Inlet State 17589 No. 1	Exploration	Natural Gas	Relief Well, No. 1-A	Burned	ADN, 2008
1965	Onshore		Moquawkie No 1.	Exploration	Natural Gas	--		ADN, 2008
2/11/-3/1967	Onshore	Marathon Oil Company	Beaver Creek No. 1	Development	Natural Gas	Bridged		ADN, 2008
5/23/-5/26/1985	Offshore	Union Oil Company	Grayling Platform	Development	Natural Gas, Water, Drilling Mud	Bridged		ADN, 2008
12/20/-12/28/1987	Offshore	Marathon Oil Company	Steelhead Platform Well M-26	Development	Natural Gas, Water, Coal, and Rocks	Relief Well Started, Bridged		ADN, 2008
9/28/-9/29/2008	Onshore	Aurora Gas	Moquawkie No. 4	Development	Natural Gas, Drilling Mud 11,000 gallons	Drilling Mud		ADEC, 2008; ADN, 2008

A-1.2.4. Historical Crude Oil Spills Greater than or Equal to 1,000 Barrels in Cook Inlet

This section presents the available information on Cook Inlet crude oil spills from pipelines or platform facilities. Oil-spill records are not complete for the entire production period of Cook Inlet (1957 to present); however, this section provides some information about the nature of oil spills from production facilities and pipelines in Cook Inlet State waters. USDOI, MMS (2003) Appendix A, Section A.1.b outlines historic spill information and has been updated by State of Alaska, Department of Environmental Conservation spill records from the Cook Inlet and Kodiak Island Subareas (ADEC, 2015).

A-1.2.4.1. Historical Crude- and Refined-Oil Spills Greater than or Equal to 1,000 Barrels from Offshore Cook Inlet Pipelines

Three spills ≥1,000 bbl are listed in the Sienkiewicz and Wondzell (1992) database. The pipeline spills in 1966 and 1967 also are listed in Gulf Canada Resources, Inc. (1982). They are shown as follows:

Year of Spill	Company Platform	Size of Spill (bbl)	Cause of Spill
1966	Shell Platform A	1,400	Pipe Rupture
1967	Shell Platform B	1,400	Pipe Rupture
1968	Shell Platform B	1,000	Pipe Rupture

The BOEM searched for spills ≥1,000 bbl in the above mentioned sources. The other available sources listed do not list crude-oil spills ≥1,000 bbl from production facilities or offshore pipelines. These databases should have included such spills if they occurred.

For purposes of analysis, the records are not complete enough for quantitative analysis. From the available records, it does not appear as though any platform spills ≥1,000 bbl have occurred. At a minimum and perhaps a maximum, three spills ≥1,000 bbl from pipelines occurred in Cook Inlet State waters. The cause of the three spills was due to vortex shedding. Pipelines installed in areas with high currents, such as Cook Inlet, normally will exhibit vortex-induced vibrations set up by the near seabed current flow. Such vibrations pose a potential fatigue-damage problem. From 1965-1976, there were 14 vortex failures, including the three large spills described previously. Industry designed a program to prevent and eliminate vortex shedding. Annual surveys of the pipeline are performed, and sand or cement bags are placed at 50-foot intervals and 1 foot off the bottom (Visser, 2002).

A-1.2.4.2. Historical Crude- and Refined-Oil Spills Greater Than or Equal to 1,000 Barrels from Tankers and Motor Vessels

Eight spills ≥1,000 bbl are listed in the Sienkiewicz and Wondzell (1992) database or Wagner, Murphy and Behlke (1969). They are as follows:

Year	Vessel Name	Location of Spill	Type of Spill	Size of Spill (bbl)
1966	Tanker Vessel	Nikiski	Diesel	2,000
1966	Tanker Vessel	Nikiski Dock	Oil	1,000
1967	T/V EVJE	Fire Island Area	Jet Fuel	6,000-10,000
1967	T/V Washington Trader	Drift River Terminal	Crude Oil	1,700
1976	USNS Sealift Pacific	Nikiski	JP-4	9,420
1984	M/V Cepheus	Near Anchorage	Jet A	4,286
1987	T/V Glacier Bay	Near Kenai	Crude Oil	3,100
1989	Lorna B	Nikiski	Diesel	1,547-1,714

In addition to the previously mentioned tanker spills, there were at least two documented spills from outside the Cook Inlet area that have drifted into Cook Inlet. The first spill was from an unidentified source documented by the Federal Water Pollution Control Administration (1970). The suspected source of the spill was from a tank vessel dumping ballast and slop at sea, which was a common practice at that time. No oil-spill volume is estimated. Based on the estimated number of dead birds and the length of coastline oiled, BOEM estimates this spill was ≥1,000 bbl. This spill impacted lower Cook Inlet, including the Barren Islands, Kodiak Island, and Shelikof Strait. The second documented tanker spill was the T/V *Exxon Valdez*. This spill drifted into the northern Gulf of Alaska, lower Cook Inlet and Shelikof Strait. It is estimated that approximately 1-2% of the spill entered lower Cook Inlet reaching as far north as Anchor Point.

A-2. Behavior and Fate of Crude Oils

There are scientific laboratory data and field information from accidental and research oil spills about the behavior and fate of crude oils. BOEM discusses the background information on the fate and behavior of oil in subarctic environments and its behavior and persistence properties along various types of shorelines. BOEM also makes several estimates about environmental parameters to perform modeling simulations of oil weathering that are specific to the large spills BOEM estimates for analysis purposes.

A-2.1. Generalized Processes Affecting the Fate and Behavior of Oil

Several processes alter the chemical and physical characteristics and toxicity of spilled oil. Collectively, these processes are referred to as weathering or aging of the oil. The major oil-weathering processes are spreading, evaporation, dispersion, dissolution, emulsification, microbial degradation, photochemical oxidation, and sedimentation to the seafloor or stranding on the shoreline (Payne et al., 1987; Boehm, 1987; Fingas, 2011; Lehr, 2001; USDOI, MMS, 2007, Figure A.1-2).

Along with the physical oceanography and meteorology, weathering processes determine the oil's fate in the environment. Potter et al. (2012), Dickins (2011), and Lee et al. (2011) reviewed the state of fate and behavior of oil in ice and documented the relevant studies; some of which were detailed in the USDOI, MMS (2007) Lease Sale 193 FEIS, Appendix A, 2.1. Collectively, 40 years of research underpin the available science on fate and behavior of oil in open water and ice.

Further research on the fate of oil spills and oil dispersants is ongoing. Gong et al. (2014) documents the relationship between sediment particle size and concentration, oil properties, and salinity characteristics and their contribution to the formation and characteristics of oil sediment-particulate-material aggregates. Beegle-Krause et al. (2014) reviewed the literature on the fate of either mechanically or chemically dispersed oil under ice and determined that under-ice turbulence was a key variable. Turbulence would tend to keep oil droplets in suspension but is significantly reduced under ice fields and oil droplets do not remain in suspension. Further research is also ongoing within Industry (Mullin, 2014) and government.

The potential volume of oil entrained in the interstitial space of the sea ice crystal fabric was studied using salinity and temperature data from Barrow, Alaska. Petrich, Karlsson, and Eicken (2013) found oil entrainment increases from January to May. Entrainment may reach approximately 20% of the potential oil volume pooled beneath sea ice.

Fingas and Hollebone (2014) conclude that the behavior of oil in ice can be modeled based on previous research. However, they stress that new available technologies for measurement have the potential to move the science forward. Initial studies suggest oil spreads differently when spilled in young ice (frazil, nilas, or pancake). Wilkinson et al. (2014) documented oil penetrating frazil ice and frazil ice inhibiting brine channel migration. Waves were a controlling factor in the spread of oil associated with young ice.

Natural indigenous microbial organisms inhabit subarctic waters and sea ice brine channels. McFarlin et al. (2011a, b; 2014) studied crude oil biodegradation under cold and light-limiting conditions using indigenous microbes collected from the Beaufort and Chukchi seas. Biodegradation occurred down to -1º C. Bagi et al. (2014) also suggests that biodegradation capacity in cold seawater may not be inherently lower than the biodegradation capacity of microbes in temperate seawater.

A-2.2. Oil-Spill Persistence

Oil spill persistence on water or on the shoreline can vary widely, depending on the size of the oil spill, the environmental conditions at the time of the spill, the substrate of the shoreline and, especially in the case of portions of Cook Inlet, ongoing shoreline erosion. Persistence on water and then on shorelines is discussed below.

A-2.2.1. On-water Oil-Spill Persistence

In this analysis, BOEM conservatively assumes 1,700- and 5,100-bbl crude oil spills could last up to 30 days on the water as a coherent slick. After that, the weathering process (Section 2.1) would degrade the oil on the surface of the water, making it hard to track. During higher wind speeds and wave heights, spills of these sizes may dissipate more quickly.

A-2.2.2. Shoreline Type, Oil Behavior, and Persistence

The Lower Cook Inlet/Shelikof Strait shoreline oil-retention characteristics were surveyed by Michel, Jordana, and Ballou (1986); Domeracki et al. (1981); Ruby et al. (1979); and Michel and Ballou (1986). Gundlach et al. (1990) published a dataset summarizing shoreline characteristics from the above reports into seven numbered environmental sensitivity index (ESI) types for Cook Inlet/Shelikof Strait which make up the Cook Inlet Planning Area. In general, the higher the ESI number, the longer the oil is estimated to persist in that type of substrate. In 2001, Cook Inlet Regional Citizens Advisory Council conducted a demonstration project applying a coastal habitat inventory method called ShoreZone. That protocol continues today and provides useful information on shoreline type and information to estimate persistence (Harper and Morris, 2014).

Stranded-oil persistence results from oil remaining after cleanup or in locations where cleanup may cause more environmental damage than if the oil were left in place. The coastal environments adjacent to the Cook Inlet Planning Area are similar to and, in some cases, are the same coastal environments contacted by Exxon Valdez Oil Spill in Prince William Sound and the Gulf of Alaska. Therefore, shoreline-oil persistence and weathering in Prince William Sound provides an analogy for how oil may weather if an oil spill contacted the coastal areas adjacent to the planning area. However, Cook Inlet and Shelikof Strait have more wave exposure and energy, which may accelerate weathering processes or hinder it due to boulders armoring the substrate (Irvine, Mann and Short, 1999, 2006; Short et al., 2007). Some of the coastal environments adjacent to the Cook Inlet Planning Area were previously oiled from the Exxon Valdez spill. Re-oiling from another spill would affect oil persistence and weathering.

The coastal environment adjacent to the Cook Inlet Planning Area has approximately 49% exposed rocky shore. The ESI predicts short-term effects for exposed rocky shores. During the Exxon Valdez oil spill, most exposed rocky shorelines showed little to no oil persistence besides staining and scattered tar blotches (Gundlach et al., 1990). On a small scale, however, these rocky shorelines are indented and fractured, creating numerous pockets. Some rocky shorelines are sheltered from wave and wind direction. On some exposed rocky shores sheltered to wind and waves, heavy oil concentrations were found eight months after the Exxon Valdez spill (Gundlach et al., 1990).

The areas adjacent to the Cook Inlet Planning Area have about 31% mixed sand and gravel beaches and 12% gravel beaches. The ESI predicts oil mixing deeply (less than 10 centimeters up to a meter) in well-sorted sand and gravel, gravel material, and especially deep burial along the berm. Mixed sand and gravel beaches were a shore type affected by the Exxon Valdez spill (Gundlach et al., 1990). Gravel beaches pose a special problem because of the potential for deep oil burial and the persistence of subsurface oil for decades (Hayes, Michel, and Noe, 1991; Hayes and Michel, 1999; Irvine, Mann, and Short, 1999, 2006; Michel et al., 1991; Michel and Hayes, 1993a, 1993b; Owens, 1991, 1993). Gravel beaches enhance oil accumulation through burial by accretion features and the formation of asphalt pavement, and the armoring of the gravel beach impedes erosion (Hayes, Michel and Noe, 1991; Michel and Hayes, 1993a, 1993b).

The areas adjacent to the Cook Inlet Planning Area have approximately 2% coarse-grained-sand beaches. The ESI predicts oil deposition primarily high on the beach face and potential deep burial along the berm. Oil persistence depends on the wave energy, with sheltered areas harboring oil for years to decades (Prince, Owens and Sergy (2002). The ESI predicts longer persistence on coarse- rather than fine-grained-sand beaches. On fine-grained-sand beaches in Katmai, oil remained on or near the surface (Gundlach et al., 1990). Clay-oil flocculation is identified as a process on fine-grained-sand beaches that accelerates weathering and prevents asphalt-pavement formation, thereby reducing oil persistence (Bragg and Yang, 1993).

Exposed tidal flats make up approximately 3% of the areas adjacent to the Cook Inlet Planning Area. The ESI predicts that most oil would be pushed across the tidal flat onto adjacent shores. The high sensitivity rating is due to the biological components using the tidal flat. Coarse cobbles on the tidal flat can cause oil to persist for several months (Gundlach et al., 1990).

Adjacent to the Cook Inlet Planning Area, less than 1% is marshes. This coastal environment has the highest ESI ranking of 8. The ESI predicts long-term persistence for marshes due to the sheltered nature of the shoreline or the fine-grained sediments. Recent examination of past spills continues to confirm the long term persistence of oil for marshes (Reedy et al. 2002; Wang et al., 2001). The Exxon Valdez oil spill data indicate long-term persistence (Gundlach et al., 1990).

In addition to the areas adjacent to the Cook Inlet Planning Area, BOEM also looked at ESI within the entire OSRA study area. For each land segment, the percentage of each ESI type by length is shown in Table A.1-2. Further discussion about OSRA land segments can be found in Appendix A, Section A-3.1.4. Location of Land Segments and Grouped Land Segments.

A-2.3. Oil-Spill Toxicity

Oil-spill toxicity occurs through the mode of narcosis (state of stupor or unconsciousness) caused by monocyclic aromatic hydrocarbons crossing the cell membranes as well as oil being ingested by or coating an organism. Studies on the Exxon Valdez Oil Spill in Prince William Sound revealed that larger and more persistent polycyclic aromatic hydrocarbons (PAHs) in sediments are linked to long-term effects (Peterson et al., 2003). Oil-spill toxicity is discussed in the effects of spills on each resource section.

Studies following the Deepwater Horizon (DWH) event examined the impacts of oil-dispersant usage. Rico-Martinez, Snell, and Shearer (2013) found that toxicity testing with various species of marine rotifer revealed that, when the dispersant COREXIT 9500A (which was used during the DWH spill to disperse the oil in an attempt to reduce its toxicity) was well mixed with crude oil, the toxicity increased as much as 52-fold. Without mixing, the effect was decreased to 27.6 fold. The authors noted that the rotifer strain from the Gulf of Mexico was most tolerant to oil from the Macondo well. The authors described the effect as synergistic. However, other authors have noted that the increased toxicity of COREXIT 9500A plus crude oil is actually due to the oil itself (Wu et al., 2012) because the dispersant helps the oil dissolve into the water phase and then become more bioavailable. Furthermore, Chakraborty et al. (2012) found that COREXIT 9500 was not toxic to indigenous microbes and that various components of the COREXIT 9500 were degraded. This is part of the ongoing debate that exists with the use of dispersants as a response tool. Dispersants help make the oil more bioavailable so that the oil is subject to increased degradation, including biodegradation; however, oil that is more bioavailable may also be more toxic to some species.

Gardiner et al. (2013) and deHoop et al. (2011) studied the relative sensitivity of cold-water species to oil components and to physically and chemically dispersed oil. In both of these studies, a small number of cold-water species fell within the range of sensitivities of commonly tested species, mostly of temperate climates. Bejarano, Clark, and Coelho (2014) suggest improvements to toxicity testing to make the results useful across species and geographic locations for better information to further management decisions on dispersant use.

A-2.4. Assumptions about Large Oil-Spill Weathering

To run the oil weathering model (OWM) using a consistent framework, several assumptions are made regarding the type of oil, the size of the spill, the environmental conditions, and the location of the spill. The following assumptions are used to estimate weathering of a large oil spill:

- The crude oil properties will be similar to crude oil of 20-25º API for the Action Area
- The diesel oil properties will be similar to a typical diesel for the Action Area

- The size of the diesel fuel spill is 5,100 bbl
- The size of the crude spill is 1,700 or 5,100 bbl
- There is no reduction in the size of spill due to cleanup; instead cleanup is considered separately as either mitigation or disturbance
- The wind, wave, temperature and ice conditions are as described
- The spill is a surface spill or a shallow (less than 70 m) subsea spill that reaches the water surface quickly
- The properties predicted by the OWM model are those of the thick part of the slick
- The spill occurs as an instantaneous spill over a short period of time
- The fate and behavior are as modeled (Tables A.1-3 through 5)
- The oil spill persists for up to 30 days in open water

Uncertainties exist, such as:

- The actual size of an oil spill or spills, should they occur
- Whether the spill is instantaneous or chronic
- The location of the spill
- Wind, current, wave, and ice conditions at the time of a possible oil spill
- The crude, or diesel oil properties at the time of a possible spill

A-2.5. Modeling Simulations of Oil Weathering

To judge the effect of a large oil spill, BOEM estimates information regarding how much oil evaporates, how much oil is dispersed, and how much oil remains after a certain time period. BOEM derives the weathering estimates of crude oil, and diesel fuel from modeling results from the SINTEF Oil Weathering Model (OWM) Version 4.0 (Reed et al., 2005a,b) for up to 30 days.

A-2.5.1. Oils for Analysis

The crude oil used in the analysis is a medium crude oil. A medium crude oil was chosen for simulations of oil weathering for the Lease Sale 244 Action Area, because it is a crude oil that falls within the category of 20-25° API oils estimated to occur in the Lease Sale 244 Action Area. BOEM used a typical marine diesel fuel.

A-2.5.2. Crude Oil and Diesel Fuel Simulations of Oil Weathering

This section discusses the simulation of oil weathering. BOEM uses the SINTEF OWM to perform oil weathering simulations. The SINTEF OWM has been tested with results from three full-scale field trials of experimental oil spills (Daling and Strom, 1999; Brandvik et al., 2010).

The simulated medium crude oil-spill sizes are 1,700 bbl or 5,100 bbl. The diesel-oil-spill size is 5,100 bbl. BOEM simulates two general scenarios: one in which the oil spills into open water and one in which the oil freezes into the ice and melts out into 50% ice cover.

For the Lease Sale 244 Action Area, BOEM assumes open water is April through November, and a winter spill could occur into open water or broken ice. BOEM assumes the spill starts at the surface or quickly rises to the surface in the shallow waters of the Lease Sale 244 Action Area. For open water, BOEM models the weathering of the spills as if they are instantaneous spills. For the broken ice spill scenario, BOEM models the entire spill volume as an instantaneous spill. Although different amounts of oil could melt out at different times, BOEM took the conservative approach, which was to assume all the oil was released at the same time. BOEM reports the results at the end of 1, 3, 10, and 30 days.

For purposes of analysis, BOEM looks at the mass balance of the large oil spill: how much is evaporated, dispersed, and remaining. Tables A.1-3 through 5 summarizes the results BOEM assumes for the amount evaporated, dispersed, and remaining for a diesel fuel or crude oil. The results are considered in BOEM's analysis of the effects of oil on environmental, social and economic resources or resource areas. In general, diesel fuel will evaporate and disperse in a short period of time (3-10 days). The higher the wind speeds, the more rapidly the evaporation and dispersion occur. Crude oils tend to evaporate and disperse more slowly, especially if the oils become emulsified. Crude oil properties vary, and these are representative ranges of how different light crudes may weather.

The medium crude oil contains a relatively moderate amount of high molecular-weight compounds. In weathering tests, approximately 10-24% of its original volume evaporated within 1 and 30 days, respectively, at both summer and winter temperatures. At the average wind speeds over the Lease Sale 244 Action Area during summer, dispersion is slower, ranging from 3-56% (Tables A.1-4 and 5) than during winter in open water. However, at higher wind speeds during winter (e.g., 15 m/s wind speed) the oil spill will be almost removed from the sea surface within a day through evaporation and dispersion. Dispersion is very slow during the winter in the presence of broken ice.

A-3. Estimates of Where a Large OCS Oil Spill May Go

BOEM studies how and where large OCS spills move by using an oil-spill trajectory model with the capability of assessing the probability of oil-spill contact to environmental resource areas (ERA), known as the Oil-Spill Risk Analysis (OSRA) model (Smith et al., 1982; Ji, Johnson, and Li, 2011). The “Large” oil spill means spills with a threshold size of ≥1,000 bbl. This model analyzes the likely paths of slightly less than 800,000 simulated oil spill trajectories in relation to biological, physical, and sociocultural resource areas that BOEM generically calls environmental resource areas (ERAs). The trajectory is driven by the wind, sea ice, and current data from a coupled ocean model. The locations of environmental resource areas, including sociocultural resource areas, islands, and the coast within the model study area, are used by OSRA to tabulate the percent chance of oil-spill contact to these areas. A full report is found within Ji, Smith, and Johnson (2016).

A-3.1. Inputs to the Oil-Spill Trajectory Model

There are several inputs necessary to run the oil-spill trajectory model and to assess the probability of oil-spill contact to environmental resource areas, boundary segments, and land segments, including the following:

- Study area
- Subarctic seasons
- Location of the coastline
- Location of environmental resource areas
- Location of land segments and grouped land segments
- Location of boundary segments
- Location of hypothetical launch areas
- Location of hypothetical pipelines and transportation assumptions
- Current information from a general circulation model
- Wind information

A-3.1.1. Study Area and Boundary Segments

Map A-1 (Maps are found in section A.1, Tables and Maps) shows the study area used in the oil-spill trajectory analysis. It extends from 147º W to 160º 15’W and 55º 15’ N to 61º 15’ N. The OSRA model has a resolution of 245 m by 256 m and a total of 8 million grid cells in the study area. The study area is formed by 16 offshore boundary segments and the Cook Inlet, Kodiak, Alaska Peninsula, and Gulf of Alaska coastline. The boundary segments are vulnerable to spills in both summer and winter. The study area is chosen to be large enough to allow most hypothetical oil-spill trajectories to develop without contacting the boundary segments through as long as 30 or 110 days.

A-3.1.2. Trajectory Analysis Periods

The OSRA model launches a hypothetical oil-spill trajectory from a hypothetical location called a launch point (described in detail in Section A-3.1.5) starting on day 1 in 1999, and it continuously launches the trajectory every day for a total of 10 years (1999-2009). Therefore, a total of 799,350 trajectories are launched over this time period. The trajectories are driven by the hourly wind, and ice or current data from a coupled ocean model with 10 years (1999-2009) of simulation (described in detail in Section A-3.1.6 and Danielson, Hedstrom, and Curchitser (2016), and are computed on an hourly basis.

BOEM defines three time periods for the trajectory analysis of large oil spills. These periods are the months when trajectories are started and the chance of contact is tabulated. BOEM calls these three periods annual, summer, and winter. Shown below are the three time periods that trajectories were started and the months that make them up.

Lease Sale 244 Action Area	Annual	Summer	Winter
	January-December	April-October	November - March

The annual period is from January 1 to December 30. The summer period is from April 1 through October 31 and generally represents open water or subarctic summer. The winter period is from November 1 through March 31 and represents subarctic winter. The choice of this seasonal division was based on meteorological, climatological, and biological cycles and consultation with BOEM, Alaska OCS Region analysts.

A-3.1.3. Locations of Environmental Resource Areas

Environmental resource areas (ERAs) represent areas of social, economic, or biological resources or resource habitat areas. BOEM, Alaska OCS Region analysts designate these ERAs. The analysts work with specialists in other federal and state agencies, academia and various stakeholders who provide scientific information as well as local and traditional knowledge about these resources. For biological resources, ERAs are determined by several factors including density, important habitat, and life history features. While multiple species may occur within an ERA, ERAs are assigned to those species for which there is sufficient information to confidently identify the area as important. The analysts also designate in which months these ERAs are vulnerable to spills, meaning the time period those resources occupy or use that spatial location. For example, birds migrate and may be there only from May to August. While species rare to the area or with limited sightings may preclude representation by specific ERAs the discussion of oil-spill impacts in Chapter 4 considers impacts to those species present in the area should an accidental large spill occur.

There are 155 ERAs. Maps A-2a, A-2b, A-2c, A-2d, A-2e, A-2f, A-2fg, and A-2h show the locations of the 155 ERAs. These resource areas represent concentrations of wildlife, habitat, subsistence-use areas, and subsurface habitats. The names or abbreviations of the ERAs and the general resource they represent are shown in Table A.1-6. Information regarding the general and specific ERAs for birds, whales, subsistence resources, marine mammals, and lower trophic resources is found in Tables A.1-7, 8, 9, 10, 11, and 13, respectively. Anadromous fish, terrestrial mammals and parks and special areas are not represented by ERAs but are represented by Grouped Land Segments (GLSs) shown in Tables A.1-12, 14, 15, and 17 and discussed below in section A-3.1.4. BOEM also includes Land as an additional ERA. Land is the entire study area coastline and is made up of all the individual land segments (LSs) 1 through 112, described below.

A-3.1.4. Location of Land Segments and Grouped Land Segments

The coastline was further analyzed by dividing the Cook Inlet, Kodiak, Alaska Peninsula, and Gulf of Alaska coastline into 112 LSs. Some LSs were added together to form larger geographic areas and were called GLSs. All of the onshore, coastal environmental resource locations were represented by one or more partitions of the coastline. The study area coastline is partitioned into 112 LSs of approximately 12-15 miles (20-25-kilometers) in length. The partitions are formed by creating straight lines between two points projected onto the coast; therefore, the actual miles of shoreline represented by each land segment may be greater than 15 miles, depending upon the complexity of the coastal area.

The LS identification numbers (IDs) and the geographic place names within the LS are shown in Table A.1-16. Maps A-3a, A-3b, A-3c, and A-3d show the location of these 112 LSs. Land segments are vulnerable to spills in both subarctic summer and winter. The GLSs, their names, and the individual LSs that make them up are shown in Table A.1-17. Maps A-4a and A-4b show the location of these 52 GLSs. Grouped land segments are vulnerable to spills based on the time periods shown in Table A.1-17. Anadromous fish, terrestrial mammals and parks and special areas represented by group land segments are shown in Tables A.1-12, 14, and 15.

A-3.1.5. Location Hypothetical Launch Areas and Pipelines

For this analysis, the launch areas (LAs) and pipeline segments (PLs) are hypothetical locations which have been reduced to the Lease Sale 244 Area. They are not meant to represent or suggest any particular development scenario. If and when any commercial hydrocarbons are discovered, detailed development scenarios would be engineered, designed, reviewed, and evaluated by industry, BSEE, BOEM and other applicable regulatory agencies.

Map A-5 shows the location of the six hypothetical LAs (1-6) and four hypothetical PLs (1-4) where large oil spills could originate if they were to occur. Pipeline locations are entirely hypothetical. They are not meant to represent four proposed pipelines or any real or planned pipeline locations. They are distributed throughout the lease sale area to evaluate differences in oil-spill trajectories from different locations.

Hypothetical launch points were spaced at one per lease block plus two additional launch points for pipelines leading to shore. Hypothetical launch points were spaced 4.8 km in the east-west and north-south direction. At this resolution, there were 219 total launch points in space, grouped into the six LAs (1-6) and four PLs (1-4) representing the Lease Sale 244 Action Area.

A total of 3,600 trajectories were simulated from each of 219 launch points over the 10 years of wind and ice or ocean current data, for a total of 799,350 trajectories. The results of these trajectory simulations were combined to represent platform/well spills from 6 LAs (Map A-5). Pipeline spills were represented by trajectories from each launch point along each PL (1-4, Map A-5).

For the Lease Sale 244 Action Area Alternatives 1, 3a, 3b, 3c, 4a, 4b, 5, or 6, BOEM assumes no large oil spills occur during exploration activities. Development/production activities for the Lease Sale 244 Action Area could occur in any of the LAs (1 through 6) or along any of the PLs (1 through 4). Table A.1-18 shows the assumptions about how the hypothetical launch areas were assumed to be serviced by hypothetical pipelines.

A-3.1.6. Ocean Current and Ice Information from a General Circulation Model

BOEM uses the results from a coupled ocean general circulation model to simulate oil-spill trajectories (Danielson, Hedstrom, and Curchitser, 2016). The wind-driven and density-induced ocean-flow fields and the ice-motion fields are simulated using a three-dimensional, coupled, ice-ocean hydrodynamic model (Danielson, Hedstrom, and Curchitser, 2016). The main research tool is a state-of-the-art coupled ocean/sea ice model based on the Regional Ocean Modeling System (ROMS). ROMS is a terrain-following, finite volume (Arakawa C-grid) model with the following advanced features; high-order, weakly dissipative algorithms for tracer advection; a unified treatment of surface and bottom boundary layers (Large, McWilliams, and Doney, 1994), and atmosphere-ocean flux computations based on the ocean model prognostic variables using bulk formulae (Fairall et al., 2003; Large and Yeager, 2009). The vertical discretization is based on a terrain-following coordinate system with the ability to increase the resolution near the surface and bottom boundary layers. The ROMs model includes a wetting and drying algorithm appropriate for the large tidal range in upper Cook Inlet (Oey et al., 2007). ROMS has been coupled to a sea-ice model (Budgell, 2005) consisting of the elastic-viscous-plastic (EVP) rheology (Hunke and Dukowicz, 1997) and the Mellor and Kantha

(1989) thermodynamics. The ice module is fully explicit and implemented on the ROMS Arakawa C-grid and is therefore fully parallel using Message Passing Interface, just as ROMS is. The model also includes frazil ice growth in the ocean being passed to the ice (Steele, Mellor, and McPhee, 1989). It currently follows a single ice category, which exhibits accurate results in a marginal ice zone such as Cook Inlet.

A-3.1.7. Wind Information

BOEM uses the Modern Era Retrospective Analysis for Research and Applications (MERRA) wind fields provided by Danielson, Hedstrom, and Curchitser (2016). The wind data are from 1999-2009 and was interpolated to the coupled ocean model grid at three-hourly intervals.

A-3.1.8. Large Oil-Spill Release Scenario

For purposes of this trajectory simulation, all spills occur instantaneously. For each trajectory simulation, the start time for the first trajectory was the first day of the season (winter or summer) of the first year of wind data (1999) at 6 a.m. Greenwich Mean Time (GMT). The summer season consists of April 1-October 31, and the winter season is November 1-March 31. Each subsequent trajectory was started every day at 6 a.m. GMT.

A-3.2. Oil-Spill Trajectory Model Assumptions

The oil-spill trajectory model assumptions are as follows:

- Large oil spills occur in the hypothetical launch areas or along hypothetical pipeline segments
- Operators transport the produced oil through pipelines
- A large oil spill reaches the water surface within a short period of time due to the shallow water depths
- Large oil spills persist long enough for trajectory modeling for up to 30 days
- Large oil spills occur and move without consideration of weathering. The oil spills are simulated each as a point with no mass or volume. The weathering of the oil is estimated separately in the stand-alone SINTEF OWM model
- Large oil spills occur and move without any cleanup. The model does not simulate cleanup scenarios. The oil-spill trajectories move as though no booms, skimmers, or any other response action is taken
- Large oil spills stop when they contact the mainland coastline or large islands

Uncertainties exist, such as:

- The actual size of the large oil spill or spills, should they occur
- Whether the large spill reaches the water
- Whether the large spill is instantaneous or a long-term leak
- The wind and current conditions at the time of a possible large oil spill
- How effective response or cleanup is
- The characteristics of crude or diesel oil at the time of the large spill
- How a Cook Inlet crude or diesel oil will spread
- Whether or not development and production occurs

A-3.3. Oil-Spill Trajectory Simulation

The trajectory-simulation portion of the OSRA model consists of many hypothetical oil-spill trajectories that collectively represent the mean surface transport and the variability of the surface transport as a function of time and space. The trajectories represent the Lagrangian motion that a particle on the surface might take under given wind, ice, and ocean-current conditions. Hundreds of thousands of trajectories are simulated to give a statistical representation, over time and space, of possible transport under the range of wind, ice, and ocean-current conditions that exist in the OSRA study area.

Trajectories are constructed to produce an oil-transport vector. For cases where the ice concentration is below 80%, each trajectory is constructed using vector addition of the ocean current field and 3.5% of the instantaneous wind field—a method based on work done by Huang and Monastero (1982), Smith et al. (1982), and Stolzenbach et al. (1977). For cases where the ice concentration is 80% or greater, the model ice velocity is used to transport the oil. Equation 1 shows the components of motion simulated and used to describe the oil transport for each trajectory:

1. $U_{oil} = U_{current} + 0.035\ U_{wind}$ or
2. $U_{oil} = U_{ice}$

Where:

U_{oil} = oil drift vector

$U_{current}$ = current vector (when ice concentration is <80%)

U_{wind} = wind speed at 10 m above the sea surface

U_{ice} = ice vector (when ice concentration is ≥80%)

The wind-drift factor was estimated to be 0.035, with a variable drift angle ranging from 0º-25º clockwise. The drift angle was computed as a function of wind speed according to the formula in Samuels, Huang, and Amstutz (1982). The drift angle is inversely related to wind speed.

The trajectories age while they are in the water. For each day that the hypothetical spill is in the water, the spill ages—up to a total of 30 days. While the spill is in the ice (≥80% concentration), the aging process is suspended. After coming out of the ice, that is melting into open water, the trajectory ages to a maximum of 30 days.

A-3.3.1. Results of the Oil-Spill Trajectory Simulation

A-3.3.1.1. Conditional Probabilities: Definition and Application

The chance that a large oil spill will contact a specific ERA, LS, GLS, or BS within a given time of travel from a certain location (LA or PL) is termed a conditional probability. The condition is that BOEM assumes a large spill occurs. Conditional probabilities assume a large spill has occurred and the transport of the spilled oil depends only on the winds, ice, and ocean currents in the study area. Conditional probabilities are reported for three seasons (annual, summer, and winter) and five time periods (1, 3, 10, 30, and 110 days). Conditional probabilities are expressed as a percent chance. This means that the probability (a fractional number between 0 and 1) is multiplied by 100 and expressed as a percentage.

For the Lease Sale 244 Action Area, annual, summer, and winter periods are shown in Section A-3.1.2. Contact, tabulated from a trajectory that began before the end of summer season, is considered a summer contact. BOEM also estimates the conditional probability of contact from spills that start in winter. Winter contacts are from spills that begin in winter. Therefore, if any contact to an ERA, LS, GLS, or BS is made by a trajectory that began by the end of winter, it is considered a winter contact. BOEM also estimates annual conditional probabilities of contact within 1, 3, 10, 30, and 110 days. Annual contact is for a trajectory that began in any month throughout the entire year.

A-3.3.1.2. Conditional Probabilities: Results

The chance of a large spill contacting a specific ERA, LS, GLS, or BS or any of the areas being assessed (assuming a spill has occurred) is called a conditional probability. It is conditioned on the assumption that a large spill has occurred. The conditional probability results for the oil-spill trajectory model are summarized generally below and are listed in Tables A.2-1 through A.2-60 for the Lease Sale 244 Action Area. The Maps referenced in this discussion are as follows:

- Boundary Segments (BSs) are shown in Map A-1

- Environmental Resource Areas (ERAs) are shown in Maps A-2a through A-2h
- Land Segments (LSs) are shown in Maps A-3a through A-3d
- Grouped Land Segments (GLSs) are shown in Maps A-4a through 4b
- Hypothetical Launch Areas (LAs) and Pipelines (PLs) are shown in Map A-5

For specific analysis of conditional probabilities in regard to specific resources, please see Chapter 4 of this EIS. The following section provides generalized comparisons for an overall generalized view. Probabilities in the following discussions, unless otherwise noted, are conditional probabilities estimated by the OSRA model (expressed as percent chance) of a spill ≥1,000 bbl in size contacting ERAs and LSs within the days and seasons as specified below.

A-3.3.1.3. Comparisons between Spill Location and Season

The primary differences of contact between spill locations are geographic in the perspective of east to west and northern lower inlet versus southern lower inlet and Shelikof Strait. The land segments with the highest chance of contact from all launch areas are generally along the western shores of lower Cook Inlet in Kamishak Bay and upper Shelikof Strait. Contacts to the western shorelines are greater in magnitude and length of coastline contacted is longer for LAs located on the western side of Cook Inlet. LAs in southern Cook Inlet tend to produce patterns of contacts that show spills overall move more southward in the Inlet For a particular LA, contacts to the south are further away and higher in magnitude than contacts to the north. This reflects the predominate flow in the inlet and strait to the south. The PLs generally have balanced east and west contacts. Winter contacts are generally slightly higher in magnitude than summer contacts for the same LA or PL.

A-3.3.1.4. Generalities Through Time

3 Days: Generally, the highest chances of contacts within 3 days are directly adjacent to the LAs or PLs for ERAs, LSs and GLSs.

10 Days: Generally, a large portion of the trajectories contact shoreline within 10 days due to the enclosed nature of the shoreline of Cook Inlet and Shelikof Strait. In many cases, there was little difference between the 10-day and 30-day estimated chance of contact. This is because the study area is restricted within Cook Inlet and Shelikof Strait, and long travel times for oil-spill trajectories were not observed.

30 Days: The chance of contacts within 30 days generally increase only slightly if at all from 10 days. Some ERAs, primarily lower Shelikof Strait and the northeastern side of Kodiak, farther from the LAs have chances of contact ranging from 1-5%.

A-4. Oil-Spill Risk Analysis

A measure of oil-spill risk is determined by looking at the potential for one or more large spills occurring as a result of exploration, development, or production from the Scenario, and then of a large spill contacting a shoreline segment, resource, or resource area of concern (called an environmental resource area (ERA)). If spilled crude contacts any portion of a shoreline segment or ERA, it is called simply a contact. The oil spill risk analysis helps determine the relative risk of occurrence and contact of one or more large spills in and adjacent to the Lease Sale 244 Action Area.

Combined probabilities are the chance of one or more large spills occurring and of those spills contacting over the life of the Scenario. They are estimated using the conditional probabilities, the large oil-spill rates, the resource estimates, and the assumed transportation scenarios. These are combined through matrix multiplication to estimate the mean number of one or more large spills from operations in and adjacent to the Lease Sale 244 Action Area occurring and of any of these spills making a contact.

A-4.1. Chance of One or More Large Spills Occurring

The chance of one or more large spills occurring is derived from two components: (1) the large spill rate and (2) the resource-volume estimate. The spill rate is multiplied by the resource volume to estimate the mean number of spills. Oil spills are treated statistically as a Poisson process, meaning that they occur independently of one another. If BOEM constructed a histogram of the chance of exactly 0 spills occurring during some period, the chance of exactly 1 spill, or exactly 2 spills, and so on, the histogram would have a shape known as a Poisson distribution. An important and interesting feature of this distribution is that it is entirely described by a single parameter, the mean number of large spills. The entire histogram and estimate of the chance of one or more large spills occurring can be calculated from the mean number of large spills.

A-4.1.1. Large OCS Spill Rates

BOEM derives the large OCS oil-spill rates from Anderson, Mayes and LaBelle (2012). These rates are based on a trend analysis of historical large OCS spills from platforms/wells or pipelines from 1996-2010 as well as OCS production during that same time period as shown below:

Type	Mean
Platforms/Wells	0.25 spills per Bbbl produced
Pipelines	0.88 spills per Bbbl produced
Total	1.13 spills per Bbbl produced

This analysis shows that the major contributors to the large OCS spill rates are pipelines.

A-4.1.2. Resource-Volume Estimates

For Alternative 1, the Proposed Action, it is assumed that 0.215 Bbbl is produced and transported. The resource volume estimates and resource exploration and development scenarios are discussed in the EIS Section 2.4. The alternatives 3a, 3b, 3c, 4a, 4b, 5, and 6 were evaluated by the BOEM, Alaska OCS Region, Resource and Economic Analysis Section and determined to be essentially the same in terms of resource volumes as Alternative 1.

A-4.1.3. Transportation Assumptions

Section A-3.1.5 discusses the transportation assumptions for the hypothetical launch areas and their associated hypothetical pipelines.

A-4.1.4. Results for the Chance of One or More Large Spills Occurring

BOEM's estimate of the likelihood of one or more large spills occurring assumes that there is a 100% chance that development(s) will occur and 0.215 Bbbl of crude oil and 571 Bcf of natural gas will be produced. BOEM evaluates what would happen if full development as described in the Scenario occurred, even though the chance of that happening is probably very small in a frontier area like the Lower Cook Inlet. If a development occurs, this oil-spill analysis more accurately represents the chance of one or more large spills occurring.

Additionally, the chance of one or more large spills occurring as a result of operations in and adjacent to the Lease Sale 244 Action Area is estimated over the life of the development(s). For the Lease Sale 244 Action Area, crude oil and natural gas production is assumed to occur over a development and production period of 34 years. In the estimates of one or more large spills occurring, the annual chances for large spills occurring from both pipeline and platforms/wells over the entire estimated life of the development(s) are added together to get the final result.

The large spill rates used in this section are all based on the mean number of large spills per Bbbl of hydrocarbon produced. Using the above mean spill rates for large spills, Table A.1-19 shows the estimated mean number of large oil spills for the Alternatives 1, 3a, 3b, 3c, 4a, 4b, 5, or 6. BOEM estimates 0.19 pipeline spills and 0.05 platform (and well) spills could occur, for a total (over the development and production life of the Lease Sale 244 Action Area) of 0.24 spills.

For purposes of analysis, BOEM assumes one large OCS or onshore spill occurs anywhere from Alternative 1, or its alternatives. This "what-if" analysis of oil spills addresses whether such spills could cause serious environmental impact. The large spill is assumed to occur during the development and production stage. This assumption is based on the fact that a very small fraction of spills are estimated during the relatively short exploration drilling stage, as compared to the total spill frequency for exploration, development and production activities.

Now, looking at the entire 34-year oil and natural gas development and production life of the Lease Sale 244 Action Area, BOEM uses the above mean spill number to determine the Poisson distribution. Table A.1-20 shows the chance of no large pipeline spills occurring is 83%, and the chance of one or more large pipeline spills occurring is 17%. The chance of no large platform (wells and platform) spills occurring is 95% and the chance of one or more large platform (wells and platform) spills is 5%. The mean spill number total is the sum of the mean number of platform, well, and pipeline spills over the entire 34-year development and production life. The chance of no large spills occurring is 78%, and the chance of one or more large spills occurring is 22% for the Scenario.

A-4.2. Chance of a Large Spill Contacting: Conditional Probabilities

The chance of a large spill from a pipeline or platform/well in or adjacent to the Lease Sale 244 Action Area contacting boundary segments, environmental resources area, land segments or grouped land is taken from the oil-spill trajectory model results, called conditional probabilities. These are summarized in Section A-3.3.1 and are listed in Tables A.2-1 through A.2-60.

A-4.3. Results of the Oil-Spill Risk Analysis: Combined Probabilities

The combined probabilities represent the estimated overall (combined) chance that one or more large spills (≥1,000 bbl) will both occur and contact a specific resource area. Tables A.2-61 through A.2-64 illustrate the annual combined probabilities for the Lease Sale 244 Action Area for Alternatives 1, 3a, 3b, 3c, 4a, 4b, 5, or 6.

A-5. Accidental Small Oil Spills

Small spills are spills that are <1,000 bbl. Tables A.1-1, A.1-21, and A.1-22 show the small spills BOEM analyzes for the effects of small spill(s) in Chapter 4. BOEM considers two oil types for small spills: crude and refined oil.

Small spills, although accidental, are relatively common. These are dealt with using routine spill prevention and response measures. Small spills would occur from both exploration and development activities. The majority of small spills could be contained on a vessel or platform, and refined fuel spills that reach the water would evaporate and disperse within hours to a few days. Further, those spills reaching the water may be contained by booms or absorbent pads. BOEM estimates small spills are likely to occur over the life of the exploration and development activities.

A-5.1. Exploration

Exploration includes both geological and geophysical activities (marine seismic, geotechnical and geological surveys) and exploration and delineation drilling activities. Small spills during exploration are likely to be refined oil products such as lube oil, hydraulic oil, gasoline, or diesel fuel.

A-5.1.1. Geological and Geophysical (G&G) Activities

Small fuel spills associated with the vessels used for G&G activities could occur, especially during offshore vessel-to-vessel fuel transfers. For purposes of the oil spill analyses for Alternatives 1, 3a, 3b, 3c, 4a, 4b, 5, or 6, no large or very large crude or diesel oil spills are estimated from G&G activities, although small spills are estimated to occur. This is based on a review of potential discharges and on the historical oil spill occurrence data for the Alaska OCS and adjacent State of Alaska waters.

For purposes of analysis, BOEM estimates an offshore vessel transfer spill ranges from 0 to <1-13 bbl (USDOI, BOEM, 2015). The <1 bbl is the estimated volume of diesel fuel resulting from an offshore vessel fuel transfer accident assuming the dry quick disconnect and positive pressure hoses function properly. Dry quick disconnect couplings are designed to snap closed should the valve become disconnected with the poppet open, thereby limiting liquid release. Positive pressure fuel hoses are designed to stop pumping if the pressure is lost in the hose due to a break.

In a potential scenario, where a transfer hose ruptures and the positive pressure hoses fail, BOEM assumed that it would take a maximum of 30 seconds for someone to discover the rupture and 30 seconds to stop the pump. The estimated volume spilled during the maximum 60 second interval is likely to be approximately 13 bbl. In this scenario, BOEM assumes that all spilled fuel reached the water and none remains on the deck of the vessel.

In this analysis, BOEM assumes that for 99% of fuel transfer failures, all dry quick disconnect and positive pressure hoses function properly. BOEM also assumes that every other G&G activity has an offshore transfer fuel spill (which is a very conservative estimate, based on the fact that no offshore fuel transfer spills have been reported from G&G surveys in the Alaska Region). Also, BOEM assumes that spills do not occur in the same space and time, and that up to one G&G activity has an equipment malfunction. Therefore, fuel spills from a maximum level of anticipated annual G&G activities could range from 0 to less than 1 bbl at a minimum annually and up to 13 bbl at a maximum of fuel spilled over the life of the G&G Surveys. Table A.1-21 shows the estimated number and volume of small spills during G&G activities.

A-5.1.2. Exploration and Delineation Drilling Activities

For purposes of the oil spill analyses for Alternatives 1, 3a, 3b, 3c, 4a, 4b, 5, or 6, no large crude or diesel oil spills are estimated from exploration and delineation drilling activities. This is based on a review of potential discharges, historical oil spill and modeling data, and the likelihood of oil spill occurrence. This estimate is based on:

- The low rate of OCS exploratory drilling well-control incidents spilling crude oil per well drilled
- The fact that, since 1971, one OCS crude oil spill (large/very large) has occurred during temporary abandonment (converting an exploration well to a development well) while more than 15,000 exploratory wells were also drilled
- The low number (10) of exploration wells being drilled as a result of this proposed action
- The fact that no crude oil would be produced from the exploration wells, and the wells would be permanently plugged and abandoned
- The history of exploration spills on the Alaska OCS, all of which have been small
- The fact that no large spills occurred while drilling 86 exploration wells to depth in the Alaska OCS 1975-2015

Pollution prevention and oil spill response regulations and methods, implemented by BOEM, BSEE, and the operators and since the Deepwater Horizon spill have reduced the risk of spills and diminished their potential severity (USDOI, BOEM, 2012a; Shell, 2011; 2012, 2015).

Historical OCS exploration spill data suggest that the most likely cause of an oil spill during exploration would be operational, such as a hose rupture, and the spill could be relatively small. For purposes of analysis, up to a 50-bbl diesel fuel-transfer spill was chosen as one spill volume in the small spill category and 5-bbl was selected as the typical volume. This was based on historical exploration spill sizes in the Alaska OCS, and OCS oil-spill data, which indicated that 99.7% of all OCS spills are <50 bbl (Anderson, Mayes, and LaBelle, 2012) and estimates of USCG Worst Case Discharge (WCD), average most probable discharge and maximum most probable discharge for exploration plans (Shell, 2011, 2012, 2015).

The WCD (for the purposes of the USCG) was calculated based on the definition contained in 33 CFR 154.1029(b) (2). Operators used the following values: (1) Maximum Time to Discover Release: 5 minutes; (2) Maximum Time to Shutdown Pumping: 0.5 minutes (30 seconds) (3) Maximum Transfer Rate: 320 gpm (based on representative fuel transfer pumps on the oil spill response vessel = 7.6 bbl/min; (4) Total Line Drainage Volume: 163 gal [assuming a 4-inch by 820-ft marine hose between the pump manifold on the fuel barge and the delivery flange on the inlet piping at the drillship] or 3.9 bbl. The total volume was 48 bbl and for this analysis was rounded to the nearest ten for a value of 50 bbl.

The maximum most probable discharge is 5.0 bbl of diesel fuel. It was calculated from the definition contained in 33 CFR 154.1020 (the lesser of 1,200 bbl or 10% of the volume of the WCD).

Small spills could occur during exploration and delineation drilling activities. In this analysis BOEM assumes that every drilling activity has an offshore transfer fuel spill. Over the life of the Scenario, up to one drilling activity has a WCD and the rest have up to a maximum most probable discharge for a total of up to 5 or 50 bbl annually. These spills do not occur in the same space and time. The volumes range from 5 up to 50 bbl of fuel spilled. The estimated number and volume of small spills during exploration activities presented is displayed in Table A.1-21.

The 50 bbl spill is estimated to last less than 3 days on the surface of the water, based on the SINTEF OWM calculations. In terms of timing, a small spill from the exploration activities could happen at any time from January-December. Conservatively, BOEM assumes that the vessel would not retain any of the diesel fuel, and depending on the time of year, a small spill could reach the vessel and then the environment. The environment could be open water or open water and ice. The analysis of a small spill examines the weathering of the estimated 50 bbl diesel fuel spill.

BOEM summarizes below the estimates for the fate and behavior of diesel fuel in the analysis of the effects of oil on environmental, economic and social resources in Chapter 4. BOEM outlines the scenario assumptions for an exploration drilling small spill to provide a consistent analysis of small oil spill impacts by resource:

- A small spill occurs from each exploration drilling activity
- The spill size is typically 5 bbl; over the life of the scenario one 50 bbl spill occurs
- The oil type is diesel fuel
- The majority of small spills could be contained on a vessel or platform
- There is no reduction in volume due to cleanup or containment. (Pollution prevention, containment and cleanup are analyzed separately as mitigation and as disturbance.)
- The spill could occur at any time of the exploration operations (January-December)
- The weathering for a 5 or 50 bbl spill is as shown in Table A.1-23, and the spill lasts less than 3 days on the water
- The spill starts within the Lease Sale 244 Action Area

A-5.1.3. Modeling Simulations of Oil Weathering

To judge the effect of a small oil spill, BOEM makes estimates regarding how much oil evaporates, how much oil is dispersed, and how much oil remains after a certain time period. BOEM derives the weathering estimates of diesel fuel oil from the SINTEF Oil Weathering Model Version 4.0 (Reed et al., 2005) modeling results for up to 30 days. Table A.1-23 summarizes the results BOEM estimates for the fate and behavior of a range of small diesel fuel spills (1-50 bbl). Based on OWM modeling simulations, a small, 1-50-bbl diesel fuel oil spill will be localized and short term.

A-5.2. Development and Production

OCS petroleum oil spill frequencies are applied to estimate small spills for the Lease Sale 244 Action Area. Following is the estimated number and volume of small crude and refined oil spills during development and production:

For purposes of analysis, this EIS assumes a median small crude or refined spill size of 1 gallon for spills <1 bbl, 3 bbl for spills of 1 bbl to <50 bbl and 126 bbl for spills of 50 bbl to <500 bbl. (Anderson, Mayes and LaBelle, 2012, Table 16). An estimated 450 small crude and refined oil spills could occur during the 34-year oil and natural gas development, production, and decommissioning life for Alternatives 1, 3a, 3b, 3c, 4a, 4b, 5, or 6; an average of about 13 spills per year or a little more than 1 per month over the life of the scenario (Table A.1-21 and 22).

A-5.2.1. Small Spill Assumptions Summary

The analysis of small oil spill effects for Alternatives 1, 3a, 3b, 3c, 4a, 4b, 5, or 6 is based on the following assumptions:

- Small spills occur during exploration and delineation activities, development and decommissioning activities.
- Spills from offshore refueling during geological and geophysical activities range from 0 up to <1 bbl annually with one individual spill of approximately 13 bbl over the life of geological and geophysical activities.
- Small spills during exploration and delineation drilling operations range from 0 up to 5 bbl annually with one individual spill of 50 bbl over the life of exploration and delineation drilling activities.
- The majority of small spills could be contained on a vessel or platform.
- The oil types could be diesel during exploration and delineation activities and crude, or diesel during production.
- The small spill could occur during open water during exploration and delineation activities and at any time of the year during development and production.
- The spill weathering is shown in Table A.1-23.

A-6. Potential for Natural Gas Releases

This analysis evaluates the potential for a large gas release during natural gas development and production of 517 Bcf over 34 years, as well as the potential impacts of such releases on the environment. This analysis identifies potential releases from:

- LOWC escalating into a gas blowout at production platforms/wells
- Ruptured or leaking pipelines
- Onshore facilities

The following subsections discuss possible ways in which natural gas may be released into the environment, assign frequencies to notable events, and present hypothetical release scenarios for further environmental resource-specific analysis.

Loss of Well Control

It is possible, though unlikely, that a LOWC during natural gas production could cause a release of natural gas into the environment. A LOWC can result in a blowout, but blowouts do not always follow a LOWC incident. Also, the frequency of LOWCs can vary with the type of well drilled. The International Association of Oil and Gas Producers estimates the frequency of LOWC events at 3.6×10^{-4} gas blowouts per exploration well, and at 7.0×10^{-4} gas blowouts per development well drilled (IAOGP, 2010). The production well-control blowout incident rate for production of gas is an order of magnitude lower, estimated at 5.7×10^{-5} blowouts per well year (IAOGP, 2010). The estimated mean number of gas releases is less than one (0.04). The chance of no gas blowouts occurring is 96% and the chance of a gas release occurring is 4% over the life of the Proposed Action or its alternatives.

In year 7, infrastructure will have been installed, and sale of natural gas from the Lease Sale Area is expected to begin. When this occurs, it is assumed that one well control incident of a single well on the facility could occur, releasing 8 million cubic feet of natural gas for one day. This is based on the average well production for one day from one well and the estimated rates of blowout duration for gas production wells.

Ruptured Pipeline

Although unlikely, there exists some potential for a gas pipeline to rupture. The estimated rate of offshore gas pipeline ruptures in the Gulf of Mexico is 2.4×10^{-5} per mile-year (USDOI, MMS, 2009). For a 115 mile offshore gas transmission pipeline system, over a 33 year production life, the estimated number of incidents is 0.09 offshore gas pipeline ruptures over the life of the gas sales. For onshore gas pipelines, the estimated spill rate for a generic DOT onshore gas transmission lines from 1994-2013 is 1.5×10^{-4} spill or release per pipeline mile per year (USDOT, 2013a, b). For a 50 mile onshore pipeline, over a 33 year production life, the estimated number of significant incidents using DOT's estimated rate is 0.27 pipeline incidents over the life of the gas sales. Under DOT regulation, significant incidents are incidents that involve property damage of more than $50,000, injury, death, release of gas, or that are otherwise considered significant by the operator.

If a major release of dry natural gas would occur, this would cause a sudden decrease in gas pressure, which in turn would automatically initiate procedures to close the valves on both ends of the ruptured segment of pipeline. Closure of the valves would effectively isolate the rupture and limit the amount of natural gas released into the environment. Given the daily flow rate and the estimated total number of valves, it is estimated that approximately 20 million cubic feet could be released within one pipe section between two valves. Onshore any gas releases from an elevated pipeline would disperse into the atmosphere. There is some small potential for ignition.

Onshore Facility

Although unlikely, there remains some potential for a gas leak and explosion at the onshore facility, due to the enclosed space in the facility.

Gas Release Fate

Natural gas is primarily made of up methane CH_4 and ethane C_2H_6 which make up 85-90% of the volume of the mixture. Propane, butane, and heavier hydrocarbons can be extracted from the gas system and liquefied for transportation and storage. These natural gas products are commonly known as liquid petroleum gas or LPG. Pentanes through decane are the intermediate-weight hydrocarbons and are volatile liquids at atmospheric temperature and pressure. The common names for these natural gas products are pentanes-plus, condensate, natural gasoline, and natural gas liquids (NGLs). Produced gas is expected to be dry gas (no water or condensates).

In the event of a pipeline rupture, the leak detection system would close the pipeline isolation valves. Any release would be almost entirely vapor, rather than liquid. Winter temperatures could cause the butane and pentane components to initially remain in a liquid state. However, if any liquids formed, much of the volume would quickly evaporate due to the volatile nature of NGLs. The consequences of an accidental spill of NGLs as a result of a pipeline rupture could include fire and/or explosion of NGL vapors.

The primary component of natural gas is methane, a colorless, odorless, and tasteless gas. It is not toxic in the atmosphere, but is classified as a simple asphyxiate, possessing an inhalation hazard. As with all hydrocarbon gases, if inhaled in high enough concentration, oxygen deficiency could occur and result in suffocation. The specific gravity of methane is 0.55 (Air = 1.0). Being lighter than ambient air, it has the tendency to rise and dissipate into the atmosphere, rather than settle into low areas. For this reason, natural gas leaks are assumed to rise and disperse.

A-7. Very Large Oil Spills

Very large spills could potentially come from four sources associated with OCS exploration or development operations: (1) pipelines (2) facilities (3) tankers or (4) support vessels. BOEM reviewed those four sources and determined that loss of well-control (LOWC) incidents have the potential for the largest spill volumes, assuming all primary and secondary safeguards fail and the well does not bridge (collapse in on itself). At this time, pipelines are the preferred mode of petroleum transport (over tankers) in the Cook Inlet OCS and, therefore, BOEM did not consider the loss of a fully loaded tanker. The loss of the entire volume in an offshore pipeline would be less than a long duration well control incident with high flow rates. Sizes of spills from support vessels were considered based on foundering and the loss of entire fuel tanks, and determined to be lower in volume than a well control incident where all primary and secondary safeguards failed. For purposes of analysis, BOEM examined a well control incident which escalates into a long duration blowout requiring a relief well to terminate the flow. This EIS details the oil spill analysis results that are relevant to the very large oil spill (VLOS) analysis in Chapter 4.

A-7.1. VLOS Scenario

To facilitate analysis of the potential environmental impacts of a VLOS in the Cook Inlet, it is first necessary to develop a VLOS scenario. Scenarios are conceptual views of the future and represent possible sets of activities. They serve as planning tools that make possible an objective and organized analysis of hypothetical events. This VLOS scenario is not to be confused with what would be expected to occur as a result of any of the action alternatives.

The VLOS scenario is sometimes confused with worst-case discharge (WCD) analyses, which are used to evaluate an Exploration Plan (EP) or Development and Production Plan (DPP). Both calculations are alike in that they are performed by BOEM using similar assumptions and identical analytical methods; however, these calculations differ in several important ways (Table A.1-24):

Very Large Oil Spill. Rather than analyzing a specific drilling proposal, the VLOS model selected a prospect within an area that potentially maximizes the variables driving high flow rates. Therefore, the VLOS scenario represents an extreme case in flow rate and discharge period that, in turn, represents the largest discharge expected from any site in the subject area.

Worst-Case Discharge. Site-specific WCDs at sites identified in a submitted plan in the subject area would typically result in much lower initial rates and aggregate discharges if discharge periods are held equal. The calculations also differ in their purpose. Whereas the VLOS scenario is a planning tool for NEPA environmental impacts analysis, a WCD is the calculation required by BSEE and BOEM regulations 30 CFR Part 254.47(b), BOEM NTL 2015-001 and 30 CFR 550.213(g) respectively, to accompany an Exploration Plan or Development and Production Plan and provide a basis for an Oil-spill Response Plan.

The VLOS scenario is predicated on an unlikely event—a loss of well control during exploration or development that leads to a long duration blowout and a resulting VLOS. Information on OCS well control incidents was addressed in Appendix A, Section A-4.4.1. It is recognized that the frequency for a VLOS on the OCS from a well control incident is very low. Recent analyses have estimated the frequency ranges from $>10^{-4} - <10^{-5}$ (USDOI, BOEM, 2016, Figure 3.4-1; Bercha Group, Inc., 2014a).

The low chance that the exploration well would successfully locate a large oil accumulation, coupled with the observed low incidence rates for accidental discharges in the course of actual drilling operations, predicts a very small, but not impossibly small, chance for the occurrence of a VLOS event. But this consideration of probability is not, nor should it be, integrated into the VLOS model. The VLOS discharge quantity is “conditioned” upon the assumption that all of the necessary chain of events required to create the VLOS actually occur (successful geology, operational failures, escaping confinement measures, reaching the marine environment, etc.). The VLOS discharge quantity is, therefore, not “risked” or reduced by the very low frequency for the occurrence of the event.

A-7.1.1. VLOS Scenario Parameters

A-7.1.1.1. Rate, Time and Composition of Hypothetical Spill

The VLOS scenario assumes a blowout leading to a very large oil spill. In developing this scenario, BOEM first generated a hypothetical oil discharge model that estimates the highest possible uncontrolled flow rate that could occur from any known prospect in the Lease Sale Area, given real world constraints. The discharge model was constructed using a geologic model for a specific prospect in conjunction with a commercially-available computer program (AVALON/MERLIN) that forecasts the flow of fluids from the reservoir into the well, models the dynamics of multiphase (primarily oil and gas) flow up the wellbore, and assesses constraints on flow rate imposed by the open wellbore and shallower well casing. This model utilized information and selected variables that, individually and collectively, provided a maximized rate of flow. The most important variables for the discharge model included thickness, permeability, oil viscosity, gas content of oil, and reservoir pressure. Many other variables of lesser importance were also required.

Table A.1-25 summarizes the results of the discharge model for the hypothetical well. The oil discharge climbs rapidly to over 2,100 bbl/day during Day 1. After peaking in Day 1, Figure A-1 shows that the oil discharge (green boxes) declines through the days of flow as the reservoir is depressurized by approximately 228 psia by day 80 (Table A.1-25).

The decline in the flow rate flattens somewhat after Day 12, then declines gradually to 1,382 STB/day (65% of the Day 1 peak rate of 2,135 STB/day) by Day 80 when the near-wellbore reservoir pressure has fallen to 2,892 psia or 80% of the initial reservoir pressure (3,120 psia). The total oil discharge by the end of the flow period on Day 80 is 121,467 STB.

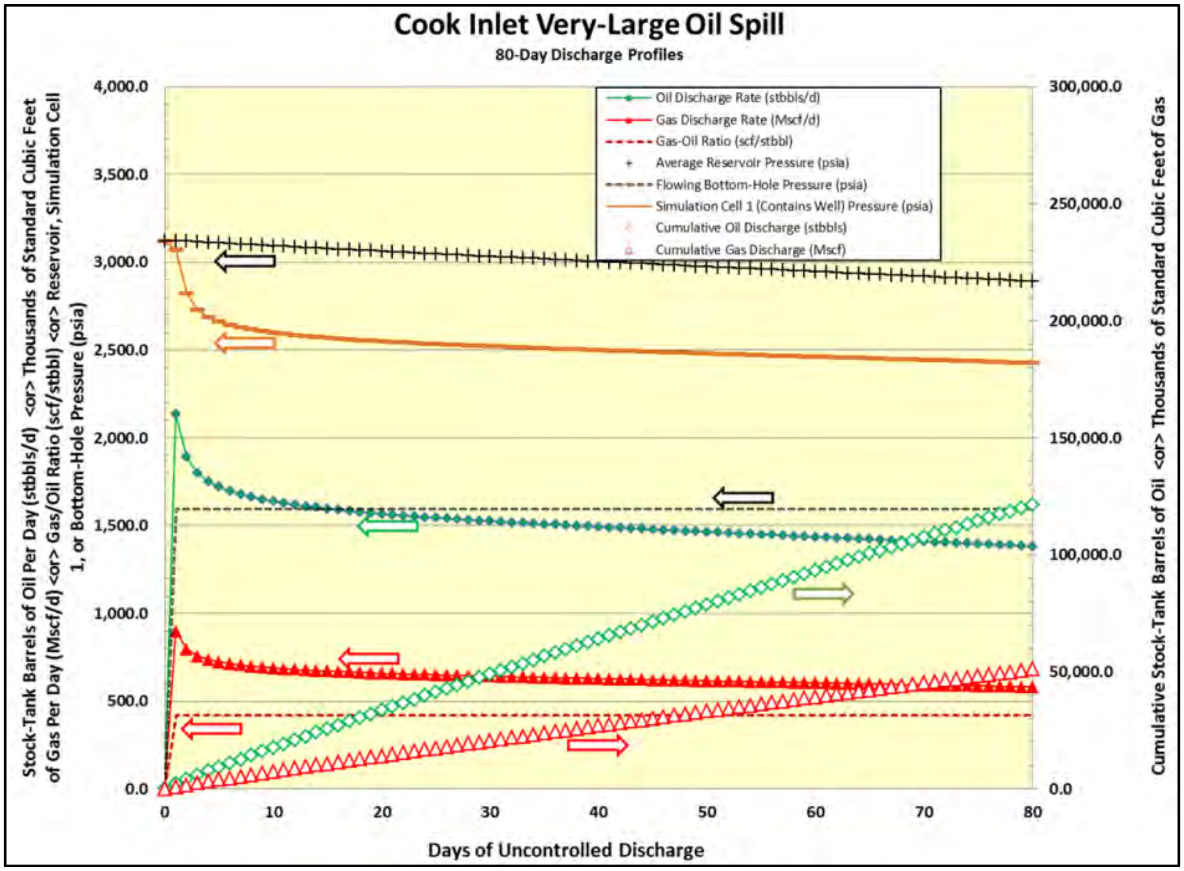


Figure A- 1. **Changing 80 Day Discharge Rate after Well Blowout.** *Decline in daily discharge rates and rising cumulative oil discharge for an 80-day period after a blowout at a hypothetical exploration well in the Cook Inlet Planning Area.*

The oil discharged from the hypothetical well is estimated to be 23° API crude oil like that recovered at the Pennzoil Starichokof State 1 well. This type of crude oil is believed to typify the Hemlock-Lower Kenai Group reservoirs in the southern part of the Cook Inlet geologic basin. The oil in the hypothetical reservoir is initially undersaturated (with gas) at a gas-oil ratio of 421 SCF/STB (quantities at standard conditions of 60°F (15.6°C) and 1 atm.) and this is reflected by the fact that the initial produced gas-oil ratio in the flow model (Day 1, see Table A.1-25) is also 421 SCF/STB. Water production over the flow period is minimal (as shown in Table A.1-25) because of the higher relative permeability to oil within the oil-saturated reservoir and the assumed absence of a brine-saturated reservoir in contact with the wellbore.

A-7.1.1.2. Cause of Spill

This scenario begins with an unlikely event: a loss of well control during drilling, workover or production that leads to a long duration blowout and a VLOS.

For the purpose of the analysis, an explosion and subsequent fire are assumed to occur. A blowout associated with a single well could result in a fire that would burn for 1 or 2 days. The exploration drilling rig may sink. If the blowout occurs in shallow water, the sinking rig may land in the immediate vicinity; if the blowout occurs in deeper water, the rig could land a great distance away. For example, the Deepwater Horizon drilling rig sank, landing 1,500 feet from the subsea wellhead. Water depths in the majority of the Lease Sale Area range from about 30 feet to approximately 210 feet; this range is considered shallow water.

For the purpose of modeling flow rates, the location of the blowout and leak was specified as occurring near the mudline (at the top of the blowout preventer). For the purpose of environmental effects analysis, it is acknowledged that a blowout could occur in other locations, such as at the sea surface, along the riser anywhere from the seafloor to the sea surface, or below the seafloor (outside the wellbore). The environmental effects analysis in Chapter 4 encompasses all these possibilities. As different blowout and leak locations may have bearing on spill response and intervention options.

A-7.1.1.3. Timing of the Initial Event

For purposes of analysis, the hypothetical VLOS is estimated to occur any time of the year January through December. Any drilling associated with the Proposed Action would be anticipated to occur within 13 years of the lease sale at the conclusion of this NEPA process, based on the E&D Scenario. The lease sale can also be canceled, in which case no drilling would occur as a result of Lease Sale 244.

A-7.1.1.4. Volume of Spill

Well blowouts generally involve two types of hydrocarbons, namely crude oil (or condensate) and natural gas. The volume ratio of these two fluids is a function of the characteristics of the fluids and the producing reservoir.

Table A.1-25 summarizes the results of the discharge model for the hypothetical VLOS. The oil discharge climbs rapidly to over 2,100 STB/d during day one. After peaking in Day 1, Figure A-1 shows that the oil discharge declines through the first 80 days of flow as the reservoir is depressurized by approximately 618 psi (Table A.1-25). As shown in Table A.1-25, the cumulative oil discharge over an 80-day spill is 121,467 STB. To simplify the analysis, BOEM estimates 120,000 bbl of oil are spilled in the VLOS scenario.

A-7.1.1.5. Duration of Spill

The duration of the OCS spill from a blowout depends on the time required for successful intervention. Intervention may take a variety of forms. There exists a variety of methods by which an operator or responder can stop the flow of oil. The availability of some of these techniques could vary under individual exploration plans. Under NTL 2015-N01, all exploration plans must specify as accurately as possible the time it would take to contract for a rig, move it on site, and drill a relief well (USDOI, BOEM, 2015). For purposes of analysis within this VLOS scenario, BOEM estimates the discharge would be stopped within 80 days of the initial event. This duration reflects the longest of three estimated time periods for completing a relief well as described in Table A.1-26 and rounded up to the nearest ten.

A-7.1.2. Spill Cause, Movement, and Response Parameters

The following discussion describes additional parameters of the VLOS scenario. These parameters are based on reasonably foreseeable factors related to oil spills, based on past VLOS events (i.e. the Exxon Valdez Oil Spill (EVOS), DWH event, and the Ixtoc oil spill), published scientific reports, consideration of Arctic-specific conditions, and application of best professional judgment. The result is a framework for identifying the most likely and most significant impacts of the hypothetical VLOS event. Key aspects of the scenario are listed below:

- A loss of well control during exploration drilling leads to a blowout and an ongoing, high volume release of crude oil and gas that continues for up to 40-80 days
- Oil remains on the surface of the water for up to a few weeks after flow has stopped
- The total volume of the oil is nearly 120,000 STB and the volume of the gas is 51 MSCF (million cubic feet)—within 80 days
- Roughly 17-20 percent of the VLOS evaporates. A small portion of the spill remains in the water column as small droplets. The remaining oil could be physically or chemically dispersed, sedimented, beached, weathered into tar balls, or biodegraded
- Information about where a very large spill could go and how long it takes to contact resources is estimated by an oil-spill trajectory model

A-7.1.2.1. Area of Spill

When oil reaches the sea surface, it spreads. The speed and extent of spreading depends on the type of oil and volume that is spilled. A spill of the size analyzed here would likely spread hundreds of square miles with some trajectories reaching lower Shelikof Strait. Also, the oil slick may break into several smaller slicks, depending on local wind patterns that drive the surface currents in the spill area. Estimates of where the oil spill would go were taken from the OSRA trajectory analysis (see Appendix A, Section A-7.5 and A.2-24, 25, 29, 30, 34, 35, 39, 40, 44, 45, 49, 50, 54, 55, 59 and 60).

A-7.1.2.2. Oil in the Environment: Properties and Persistence

The fate of oil in the environment depends on many factors, such as the source and composition of the oil, as well as its persistence (NRC, 2003). Persistence can be defined and measured in different ways (Davis et al., 2004), but the National Research Council (NRC) generally defines persistence as how long oil remains in the environment (NRC, 2003). Once oil enters the environment, it begins to change through physical, chemical, and biological weathering processes (NRC, 2003). These processes may interact and affect the properties and persistence of the oil through:

- Evaporation (volatilization)
- Emulsification (the formation of a mousse)
- Dissolution
- Oxidation
- Transport processes (NRC, 2003)

Horizontal transport takes place via spreading, advection, dispersion, and entrainment while vertical transport takes place via dispersion, entrainment, Langmuir circulation, sinking, overwashing, partitioning, and sedimentation (USDOI, MMS, 2007 FEIS, Appendix A, Figure A.1-1 Fate of Oils Spills in the Ocean During Arctic Summer, and Figure A-2. Fate of Oil Spills in the Ocean During Arctic Winter). The persistence of an oil slick is influenced by the effectiveness of oil-spill response efforts and affects the resources needed for oil recovery (Davis et al., 2004). The persistence of an oil slick may also affect the severity of environmental impacts as a result of the spilled oil.

Crude oils are not a single chemical, but instead are complex mixtures with varied compositions. Thus, the behavior of the oil and the risk the oil poses to natural resources depends on the composition of the specific oil encountered (Michel, 1992). Generally, oils can be divided into three groups of compounds: (1) light-weight, (2) medium-weight, and (3) heavy-weight components.

The oil discharged from the hypothetical Cook Inlet VLOS well is 23° API crude oil. This oil would be considered medium-weight as shown in Table A.1-27. On average, medium-weight crude oils are characterized as outlined in Table A.1-27.

Previous studies (Boehm and Fiest, 1982) supported the estimate that most released oil in shallow waters similar to the Cook Inlet would reach the surface of the water column. A small portion (1-3%) of the Ixtoc oil remained in the water column (dispersants were used), although limited scientific investigation occurred and analytical chemical methods 30 years ago may not have been as sensitive as today (Boehm and Fiest, 1982; Reible, 2010).

A-7.1.2.3. Release of Natural Gas

The quality and quantity of components in natural gas vary widely by the field, reservoir, or location from which the natural gas is produced. The oil in the VLOS reservoir is assumed to be initially undersaturated (with gas) at a gas-oil ratio of 421 SCF/STB (quantities at standard conditions of 60°F (15.6°C) and 1.0 atm.) and this is reflected by the fact that the initial (Day 1) produced gas-oil ratio in the model (Table 4-55) is also 421 cf/bbl. As shown in Table A.1-25, the produced gas-oil ratio remains constant at 421 cf/bbl during the discharge period.

Gas discharge reaches a peak of 899 MSCF/d in Day 1 of the flow, falling to a minimum rate of 582 MSCF/day on Day 80. The cumulative gas discharge over the 80-day period (assumes completion of a relief well is required for the very large discharge case) is 51,138 MSCF. For purposes of analysis BOEM estimates 0.051 Bcf billion cubic feet. Natural gas is primarily made up of methane (CH_4) and ethane (C_2H_6) which make up 85-90% of the volume of the mixture.

A-7.1.2.4. Duration of Subsea and Shoreline Oiling

The duration of the shoreline oiling is measured from initial shoreline contact until the well is capped or killed and the remaining surface oil dissipates offshore. Depending on the spill's location in relation to winds, ice, and currents and the well's distance to shore, oil could reach the coast within 1 day to 110 days based on BOEM oil-spill trajectory analysis (Appendix A). While it is estimated that the majority of spilled surface oil would evaporate and naturally disperse offshore within 30 days of stopping the flow, some oil may remain in coastal areas until cleaned, as seen following the EVOS and DWH event (Michel et al., 2013). The generation of oil suspended particulate material or subsurface plumes from the well head would stop when the well was capped or killed. Subsurface plumes would dissipate over time due to mixing and advection (Boehm and Fiest, 1982).

A-7.1.2.5. Volume of Oil Reaching Shore

In the event of a VLOS, not all of the oil spilled would contact shore. The volume of oil recovered and chemically or naturally dispersed would vary. For example, the following are recovery and cleanup rates from previous high-volume, extended spills (Wolfe et al., 1994; Gundlach and Boehm, 1981; Gundlach et al., 1983; Lubchenco et al., 2010):

10-40 percent of oil recovered or reduced (including burned, chemically dispersed, and skimmed).

25-40 percent of oil naturally dispersed, evaporated, or dissolved.

20-65 percent of the oil remains offshore until biodegraded or until reaching shore.

In the case of the DWH event, "it is estimated that burning, skimming and direct recovery from the wellhead removed one quarter (25%) of the oil released from the wellhead. One quarter (25%) of the total oil naturally evaporated or dissolved, and just less than one quarter (24%) was dispersed (either naturally or as a result of operations) as microscopic droplets into Gulf waters. The residual amount–just over one quarter (26%)–is either on or just below the surface as light sheen and weathered tar balls, has washed ashore or been collected from the shore, or is buried in sand and sediments" (Federal Interagency Solutions Group, 2010). For planning purposes, USCG estimates that 5–30 percent of oil would reach shore in the event of an offshore spill (33 CFR Part 154, Appendix C, Table 2).

A-7.1.2.6. Length of Shoreline Contacted

While larger spill volumes increase the chance of oil reaching the shoreline, other factors that influence the length and location of shoreline contacted include the duration of the spill and the well's location in relation to winds, ice, currents, and the shoreline. The length of oiled shoreline increases over time as the spill continues. Dependent upon winds and currents throughout the VLOS event, already impacted areas could have oil refloated and oil other areas, increasing the oiled area.

A VLOS from a nearshore site would allow less time for oil to be weathered, dispersed, and/or recovered before reaching shore. This could result in a more concentrated and toxic oiling of the shoreline. A release site farther from shore could allow more time for oil to be weathered, dispersed, and recovered. This could result in a broader, patchier oiling of the shoreline.

A-7.1.2.7. Environmental Variables

The environmental conditions common to Cook Inlet/Shelikof Strait that might influence overall effectiveness of an oil spill response effort include:

- Weather (e.g., wind, visibility, precipitation, or temperature)
- Sea states, tides, or currents
- Ice or debris presence
- Natural hazards

A-7.1.2.7.1. Weather

The meteorological and topographical features of GOA cause the Cook Inlet and Shelikof Strait to be subject to marine extratropical cyclones, often relating to the passage of a low pressure system that extends south hundreds of miles. These storms move east along the Aleutian Islands from the western Pacific and are impeded by the inlet's mountainous terrain, which can cause dangerous wind conditions (NOAA, 2012). These topographical features block east-west airflow causing the formation of "channel winds" to the north and south (Schumacher, 2005).The consequences of the pressure and temperature disparity are channel winds that sometimes gust to 50 meters per second (about 97 knots, kts; 112 miles per hour, mph). The wind may flow "down Inlet" from the upper Cook Inlet while cross-channel east winds occur in the lower Cook Inlet causing convergent winds. Conversely, "up Inlet" winds combine with cross-channel winds to produce divergent wind conditions (Olsson and Liu, 2009). Mountain-gap winds create "williwaws" and waterspouts can create hazardous conditions for mariners and aviators (USDOI, MMS, 2003). A williwaw is a sudden and violent blast of wind descending from a mountainous coast to the sea. Olsson and Liu (as cited in Schumacher, 2005) note that the relative lack of direct wind observations in Cook Inlet makes quantification of such small-scale phenomena unfeasible, although they could impact boats and aircraft in the region at any given time.

Darkness, fog, falling snow, particularly heavy snowfall, and heavy rain can affect visibility. Five miles of visibility is required for dispersant operations by aircraft; booming and skimming vessels require between 0.125 nautical miles (nm) (200 m) and 0.5 nm (800 m) of visibility. Cook Inlet experiences 5.5 hours of sunlight in mid-winter, which increases to 19.5 hours by mid-summer. Based on Anchorage weather data from the U.S. Naval Observatory and reported in the CIPLC's 2012 ODPCP, low visibility of less than 1.0 nm (1.15 mi (6,000 feet) occurs only about four to five percent of the time, and is the lowest in the month of January.

Precipitation is common in Cook Inlet. Up to eight meters a year of liquid equivalent (wet) precipitation falls as a result of storms that occur once every four to five days, mostly in the cold season (Olsson and Liu, 2009). The average wet precipitation in Kenai is 20 inches (0.5 m) predominantly from late September through early January. Most wet precipitation falls as light rain and snow. In Homer, moderate rainfall is most likely in the late summer to early fall, and continues through early January; averaging 24 inches (0.61 m) in Homer (WRCC, 2015).

Colder temperatures affect response personnel and equipment. In Kenai, monthly temperatures average 7 to 63 degrees Fahrenheit (ºF), and can drop to -20ºF in December and January. In Homer, the monthly temperatures average 19 to 61ºF and are rarely below zero with an average at 5 to 10ºF in December and January (WRCC, 2015). Kenai's highest average monthly wind speed is 9 mph (7.9 kts) so that the wind chill could drop as low as -40ºF in the winter. Homer's highest average monthly wind speed is 28 mph (24 kts) so that the wind chill would be -15 ºF (WRCC, 2015).

A-7.1.2.7.2. Sea States, Tides and Currents

Tides may affect response efforts by producing varying sea states requiring different approaches to response. Tidal rips, which are strong, localized, and rather narrow currents of water, can also transport floating oil, and oil stranded on shorelines can be transported into nearshore waters and sediment during storms. Rip currents or "rip tides" are areas of rough water caused by opposing currents. The Cook Inlet can experience the largest tidal fluctuations in the world, which may exceed 20 feet (6 m). The tidal velocity of such fluctuations may be as fast as 9 mph (8 kts). There are three major oscillatory tidal currents, or rip currents, in the central portion of Cook Inlet (Oey et al., 2007). They are found east of Kalgin Island between Anchor Point and the Forelands – the East rip, the Mid-channel rip, and the West Rip (CIPLC, 2012 ODPCP, Appendix B, Figures 10-13).

A-7.1.2.7.3. Sea Ice

Sea ice can create unsafe working conditions or hamper the efficiency of oil spill response. While ice may be present in several forms, such as pack ice, shorefast ice, estuary and river ice, the largest portion of ice in Cook Inlet is freshwater ice that forms in the rivers and estuaries. The unique topography and weather systems experienced in the Cook Inlet, the Shelikof Strait, and the GOA make forecasting ice conditions difficult. The process is complicated by daily temperatures that often rise above freezing. Tidal action in the area creates piles of ice on the mud flats. Ice usually begins to form in Cook Inlet in October, expanding through November, and melts in the spring. While ice may reduce spill response options, the ice protects the shorelines and rivers from oil.

A-7.1.2.7.4. Natural Hazards

Several volcanoes lie on the west side of Cook Inlet, including Spurr, Redoubt, Iliamna, and Augustine. Volcanic eruptions may cause decreased visibility, excessive ash in the air (a hazard to personnel and aircraft), and inability to use equipment due to abrasive ash fall.

A-7.1.2.8. Recovery and Cleanup

The hypothetical VLOS scenario outlined thus far would trigger an extensive spill recovery and cleanup effort. It is anticipated that efforts to respond to a VLOS in the Cook Inlet would include the recovery and cleanup techniques and estimated levels of activities described below. It is noted that severe weather and/or the presence of ice could interfere with or temporarily preclude each of these methods. The effect of ice is analyzed in greater detail below in "Effect of Ice on Response Actions." For a comprehensive list of Arctic oil-spill response research projects that BSEE has funded, the reader is referred to BSEE Arctic Oil-spill Response research (USDOI, BSEE, 2014) which includes the subarctic areas.

In the event of a VLOS, two governmental organizations would assume prominent roles in coordinating response efforts: the Federal On-Scene Coordinator (FOSC), and the Alaska Regional Response Team (ARRT). The ARRT is an advisory board to the FOSC that provides Federal, state, and local governmental agencies with means to participate in response to pollution incidents. During a response the FOSC would consult with the ARRT on a routine basis for input regarding response operations and priorities. In addition to their advisory role during a response event, the ARRT is responsible for developing the Alaska Federal/State Preparedness Plan for Response to Oil and Hazardous Substance Discharges/Releases (Unified Plan), which details governmental incident response planning and responsibilities for the State of Alaska and 10 Subarea Contingency Plans, which provide region-specific response planning information for establishing operations in the event of a major response effort to an oil spill or hazardous material release. The Subarea Contingency Plans identify notification requirements, emergency response command structures, response procedures, community profiles, in-region response assets, logistics guidance, spill scenarios that could be encountered in the region and sensitive areas identification along with geographic response strategies, which provide suggested response actions to protect the resources at risk from a release of oil. For exploration activities in the Cook Inlet the Cook Inlet Subarea Contingency Plan is the applicable documents for addressing oil-spill response in the region.

Mechanical Recovery. Both mechanical and non-mechanical methods of oil-spill response can be utilized in the Cook Inlet to mitigate the impacts of an oil spill on the environment. The preferred means of spill response is mechanical recovery of the oil, which physically removes oil from the ocean. Mechanical recovery is accomplished through the use of devices such as containment booms and skimmers. A containment boom is deployed in the water and positioned within an oil slick to contain and concentrate oil into a pool thick enough to permit collection by a skimmer. The skimmer collects the oil and transfers it to a storage vessel (storage barges or oil tankers) where it will eventually be transferred to shore for appropriate recycling or disposal.

Dispersants. Although recent research in the use and effectiveness of chemical dispersants has shown varied results, use of dispersants may still be a response option for the Cook Inlet. Some research has shown that dispersants can be effective in cold and ice infested waters under certain conditions (Belore et al, 2009). Recently completed field scale tests conducted by SINTEF (SINTEF, 2010) as part of the Oil in Ice Joint Industry Project (JIP) in the Barents Sea have demonstrated that results from lab scale and large wave tank tests hold true in actual ocean conditions. Oil released into the ocean during broken ice conditions was readily dispersed and addition of vessel propeller wash for increased wave energy results in increased oil dispersion in these conditions. It was also demonstrated that in these cold conditions weathering of the oil was significantly slowed providing a greater window of opportunity in which to successfully apply dispersants.

Dispersant application can be accomplished by means of injection at the source or through aerial or vessel based application. There are dispersant stockpiles located in Anchorage and the Lower 48 states. Dispersant use is limited to ocean application in waters generally deeper than 10 meters; this depth restriction is used to avoid or reduce potential toxicity concerns with respect to nearshore organisms.

The Unified Plan for Alaska does not have preapproved dispersant application zones for the Cook Inlet, so each request for dispersant application would be evaluated and approved or disapproved on a case-by-case basis by the FOSC in consultation with the EPA, DOI, and DOC. The decision regarding how and when dispersants would be applied would also reside with the FOSC in consultation with EPA, DOI, and DOC. Procedures governing the application of dispersants are provided in "The Alaska Federal and State Preparedness Plan for Response to Oil and Hazardous Substance Discharges and Releases" (Unified Plan) (ARRT, 2010). However, the FOSC is not limited to this procedure and may utilize other sources of information in determining what the most appropriate dispersant method would be given a specific situation.

In-situ Burning. In-situ burning is also a viable response method for the Cook Inlet and could be approved by the FOSC in consultation with the Unified Command and the ARRT. Any in-situ burning would be conducted in accordance with the Alaska Department of Environmental Conservation's 2008 In-situ Burning Guidelines (ARRT, 2010). In-situ burning is a method that can be used in open ocean, broken ice, near shore and shoreline cleanup operations. In broken ice conditions, the ice acts as a natural containment boom limiting the spread of oil and concentrating it into thicker slicks, which aid in starting and maintaining combustion. In-situ burning has the potential to remove in excess of 90% of the volume of oil involved in the burn. In-situ burning experiments of oil in ice conducted as part of the Sintef JIP (SINTEF, 2010) has likewise demonstrated that cold temperatures serve to slow weathering of the oil, in turn expanding the window of opportunity for in-situ burning application over that experienced in more temperate regions.

Effect of Ice on Response Actions. For all response options, the presence of ice can both aid and hinder oil-spill response activities. Ice acts as a natural containment device preventing the rapid spread of oil across the ocean surface; it also serves to concentrate and thicken the oil allowing for more efficient skimming, dispersant application, and in-situ burning operations. Once shorefast ice is formed, it serves as a protective barrier limiting or preventing oil from contacting shorelines. Cold temperatures and ice will slow the weathering process by reducing volatilization of lighter volatile compounds of the oil, reducing impact of wind and waves, and extending the window of opportunity in which responders may utilize their response tools.

Conversely, ice can limit responders' ability to detect and locate the oil, access the oil by vessel, prevent the flow of oil to skimmers, require thicker pools to permit in-situ burning and eventually encapsulate the oil within a growing ice sheet making access difficult or impossible. Once incorporated into the ice, further recovery operations would have to cease until the ice sheet becomes stable and safe enough to support equipment and personnel to excavate and/or trench through the ice to access the oil. The other response option is embedding tracking devices in the ice and monitoring its location until the ice sheet begins to melt and the oil surfaces through brine channels, at which time it could be collected or burned.

Levels of Recovery and Cleanup Activities. The levels of activities required to apply the techniques described above are dependent on the specific timing and location of a spill. As weather, ice, and logistical considerations allow, the number of vessels and responders would increase exponentially as a spill continues. The levels of activities described below are reasonable estimates provided as a basis for analysis. These estimates are based on Subarea Contingency Plans for the Cook Inlet and Kodiak subareas, past spill response and cleanup efforts including the EVOS and DWH events, and the best professional judgment of BOEM spill response experts.

- Between 5 and 10 staging areas would be established.
- About 15 to 20 vessels (i.e. vessels from Cook Inlet, Kodiak and Prince William Sound, and other vessels of opportunity) could be used in offshore areas. Some of these would be capable of oil skimming. The majority of open ocean vessels would be positioned relatively close to the source of the oil spill to capture oil in the thickest slicks, thus enabling the greatest rate of recovery.
- Thousands of responders (from industry, the Federal government, and private entities) could assist spill response and cleanup efforts as the spill progresses. Weather permitting, roughly 100 skimming, booming, and lightering vessels could be used in areas closer to shore. Based on the trajectory of the slick, shallow water vessels would be deployed to areas identified as priority protection sites.
- Booming would occur, dependent upon the location of the potentially impacted shoreline, environmental considerations, and agreed upon protection strategies involving the local potentially impacted communities. About 100 booming teams could monitor and operate in multiple areas.
- Use of dispersants and/or in-situ burning could occur if authorized by the Federal On-Scene Coordinator (FOSC). Use of dispersants would likely concentrate on the source of the flow or be conducted so as to protect sensitive resources. In-situ burning operations would likewise be conducted in the area of thickest concentration to ensure the highest efficiency for the effort. In-situ burning may also be utilized in nearshore and shoreline response where approved by FOSC.
- Dozens of planes and helicopters would fly over the spill area, including impacted coastal areas. Existing airport facilities along the Cook Inlet Shelikof Strait coast (including airports at Anchorage, Kenai, Homer, Seldovia, Port Graham, Kodiak, and any other suitable airstrips) would be used to support these aircraft. If aircraft are to apply dispersants, they could do so from altitudes of 50 to 100 feet.
- Workers could be housed offshore on vessels or in temporary camps at the 5–10 staging areas.

Depending on the timing and location of the spill, the above efforts could be affected by seasonal considerations. In the event that response efforts continue into the winter season, small vessel traffic would come to a halt once the forming ice begins to form on the shoreline and drift in sufficient concentration on the ocean surface. Larger skimming vessels could continue until conditions prevent oil from flowing into the skimmers. At this point, operations could shift to in-situ burning if sufficient thicknesses are encountered. The lack of daylight during winter months would increase the difficulties of response. Depending on the location and the ice concentration, the focus of the response would shift to placing tracking devices in the forming ice sheet to follow the oil as it is encapsulated into the ice sheet.

While it is estimated that the majority of spilled oil on the water surface would be dissipated within a few weeks of stopping the flow (Federal Interagency Solutions Group, 2010) during open water, oil has the potential to persist in the environment long after a spill event and has been detected in sediment 30 years after a spill (Etkin, McCay, and Michel, 2007). On coarse sand and gravel or cobble armored beaches, oil can sink deep into the sediments. In tidal flats and salt marshes, oil may seep into the muddy bottoms.

Effectiveness of intervention, response and cleanup efforts depends on the spatial location of the blowout, leak path of the oil and amount of ice in the area. For the purpose of analysis, effectiveness of response techniques is not factored into the spill volume posited by this scenario nor considered during OSRA modeling.

A-7.1.3. Behavior and Fate of a Very Large Crude Oil Spill

The Lease Sale 193 FEIS Appendix A.1, Section B, and this Appendix, Section A-2.1 summarize the behavior and fate of crude oil. This section summarizes and updates relevant information to the VLOS analysis.

A-7.1.3.1. Release from a Well Control Incident

A very large oil and gas release could rise to the ocean surface from shallow to moderate depths on the seafloor (e.g. 1979 Ixtoc I spill) or fall from the top of the rig or platform to the surface of the ocean. The force of the gas would facilitate the formation of small oil droplets (0.5 – 2.0 mm) and to disperse them in the ocean or atmosphere (Dickins and Buist, 1981; Belore, McHale and Chapple, 1998; S.L. Ross Environmental Research Ltd, D.F. Dickins and Associates Ltd., and Vaudrey and Associates Inc., 1998). A small portion (1-3%) of droplets could form a plume as identified from Ixtoc at shallow to moderate depths without the injection of dispersants (Boehm and Fiest, 1982). The more soluble compounds within the oil may dissolve, particularly from small droplets that are prevalent in the vertical plume, which is where the vigorous turbulence occurs (Adcroft et al., 2010). Figure A-2 diagrams a subsea blowout in shallow to moderate water depths (Westergaard, 1980).

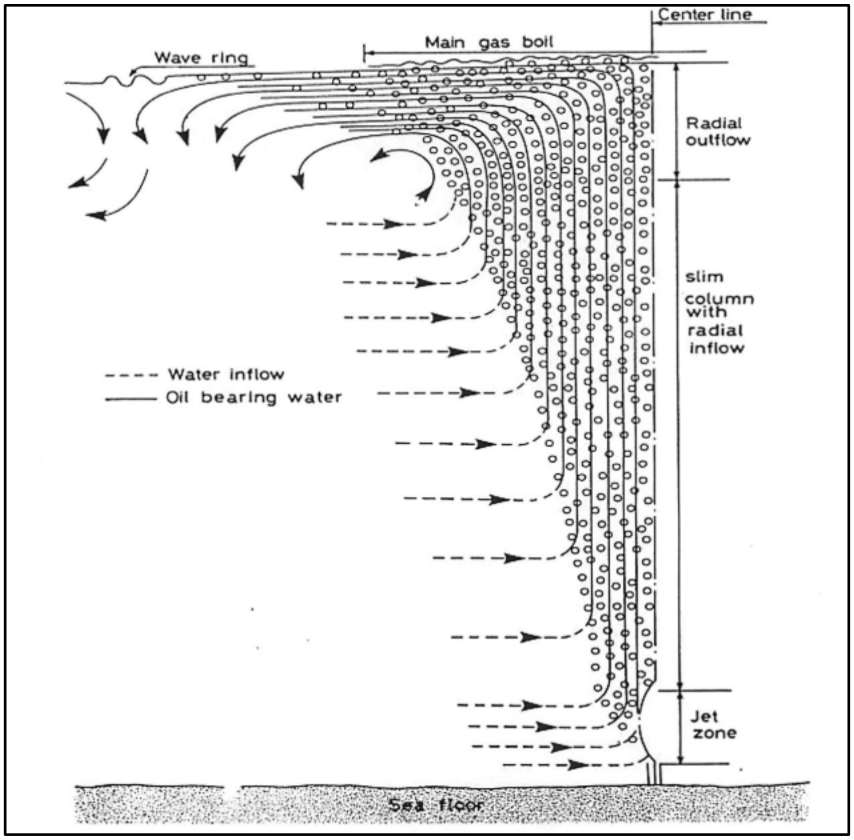


Figure A-2. Shallow (<50 meters) Underwater Blowout Plume *(Westergaard, 1980).*

A subsea release in shallow to moderate depths moves through three zones: (1) a jet zone causing turbulence and droplet formation, (2) a buoyancy zone where gas, oil, and water are carried to the surface and droplet size governs rise velocity, and (3) a surface interaction zone where the surface influence carries the oil with the prevailing currents or ice and the gas exits into the atmosphere, which causes a surface boil zone (Westergaard, 1980; PCCI, 1999; Reed et al., 2006). Volatile organic carbons would be measurable in the atmosphere downwind of the spill in a small area confined to a narrow plume (deGouw et al., 2011; Ryerson et al., 2011) during the summer open water and broken ice seasons.

For well control incidents at shallow to moderate depths, the gas is considered to be an ideal gas with a specific volume decreasing linearly with pressure. Dissolution of gas from rising bubbles may be minimal for incidents at shallow to moderate depth since the residence time of gas bubbles is expected to be short (Reed et al., 2006). Thus, very little of the gas would dissolve in the water column and nearly all of the gas would be released to the atmosphere.

A-7.1.3.2. Ice Present

The fate and behavior of oils in ice conditions is different from oil in temperate water; slower chemical and biological reactions occur when temperatures are lower. First year ice occurs in the northern and western areas of Cook Inlet. The ice would restrict the oil somewhat and reduce spreading (Gjosteen and Loset, 2004; Faksness et al., 2011). Weathering of oil in high-ice concentrations (70-90%) is significantly slower compared to weathering in open water (Brandvik et al., 2010). However, unless the oil is frozen into the ice, evaporation would continue to occur. Dispersion and emulsification rates are lower in broken ice than in open water. During winter freezeup, the oil would freeze into the grease ice and slush before ice sheeting occurs (NORCOR, 1975). Winds and storms could break up and disperse the ice and oil until the next freezing cycle occurs. These freezing cycles could be hours or days.

Faksness and Brandvik (2008a) studied the dissolved water-soluble crude oil components encapsulated in first-year sea ice. Their data show a concentration gradient from the surface of the ice to the bottom, indicating there is transport of the dissolved components up through brine channels. Field studies also showed that high air temperature leads to more porous ice, and the dissolved water-soluble components leak out of the ice rapidly; however, under cold air temperatures and less porous ice, the water-soluble components leak out of the ice more slowly and have potentially toxic concentrations (Faksness and Brandvik, 2008b).

Any oil remaining in the environment during deep winter could freeze into the forming and existing ice sheets (Dickins, 2011; Mar, Inc., et al., 2008). Then, in early spring, the unweathered oil would melt out of the ice at different rates. In first-year ice, most (85%) of the oil spilled at any one time would percolate up to the ice surface over about a 10-day period (Dickens, Buist and Pistruzak, 1981; Dickins et al., 2008; NORCOR, 1975; Nelson and Allen, 1981). Thus, in first-year ice, oil would be pooled on the ice surface for up to 10 days before being discharged from the ice surface to the water surface. The pools on the ice surface would concentrate the oil, but only to about 2 centimeters thick, allowing evaporation of 5% of the oil, the part of the oil composed of the lighter, more toxic components. By the time the oil is released from the melt pools on the ice surface, evaporation will have almost stopped, with only an additional 4% of the spilled oil evaporating during an additional 30 days on the water.

A-7.1.3.3. Open Water

Spilled oil on sea water would move with the currents, ice, and winds. In addition to sunlight breaking down the oil, sunlight also has the potential to cause photo-enhanced toxicity (Barron et al., 2008).

A-7.1.3.4. Persistence

Spilled oil in sediments weathers differently than spilled oil in the open ocean. Shoreline oiling and persistence depends on a number of factors (Etkin, McCay, and Michel, 2007). Certain factors allow for some spills to persist in the shoreline and adjacent intertidal areas for decades (Li and Boufadel, 2010; Owens, Taylor, and Humphrey, 2008; Peacock et al., 2005). Many coastlines of the study area have armored cobbled shores which can impede weathering, and high environmental sensitivity index (ESI) shoreline types such as marshes, peat, and fine-grained sediments to which oil clings. In these environments, oil tends to weather very slowly. The losses of hydrocarbons from both abiotic and biotic weathering in subsea subarctic sediments could be slow (Atlas, Horowitz, and Dushoshi, 1978; Payne, Clayton, and Kirstein, 2003). Table A.1-2 shows the percentage of ESI shoreline types of the adjacent coastlines. In general, the higher the ESI number the longer the persistence of oil. Besides oiling the shore, some components of spilled oil can deposit on the sea floor. Dispersion of oil droplets and suspension of sediments from turbulence at the discharge location could facilitate the formation of oiled sediments and oily particulate matter, which could be deposited on the seafloor in the vicinity of the discharge location (Lee and Page, 1997; Payne, Clayton and Kirstein, 2003; Sterling et al., 2004; Farwell et al., 2009).

Spilled oil can also enter tidal waters and sediments. Lee and Page (1997) reviewed several large spills and estimated 1–13% of the spilled oil entered subtidal zones with an order of magnitude less hydrocarbon concentration than found in intertidal sediments. Exceptions (for less hydrocarbon concentrations) were semi-enclosed areas with clay-silt surface sediments and high concentrations of suspended sediments (Page et al., 1989). Oil persistence in subtidal areas would be weeks to years, except for specific areas described above (Lee and Page, 1997). Biodegradation and weathering of intertidal areas in cold waters were on the order of months to decades (Atlas, Boehm, and Calder, 1981; Prince et al., 2003). A recent study of biodegradation in the Arctic showed that as temperature increased in the Arctic summer, biodegradation increased (Chang, Whyte, and Ghoshal, 2011).

A-7.1.3.5. Very Large Oil-Spill Weathering

The weathering for a very large oil spill is as follows:

- The crude oil properties will be similar to a medium crude oil of 25ºAPI
- The size of the crude oil spill ranges from about 2,100–1,400 bbl per day

- The wind, wave, and temperature conditions are as described
- The spill is a subsurface spill at approximately 40 m (meters)
- Broken ice spills occur into 50% ice cover
- The properties predicted by the model are those of the thick part of the slick
- The spill occurs as a long- duration spill estimated at a daily rate
- The fate and behavior are as modeled (See Table A.1-28)
- The oil spill persists for up to 30 days in open water and ice when the wind speed is under 6 m/s (meters/second)
- The wind speed remains 6 m/s or less

For purposes of analysis, we look at the mass balance of the VLOS; in other words, how much is evaporated, dispersed, and remaining. At the average wind speeds over the Lease Sale 244 Proposed Action Area, dispersion is estimated to be moderate, ranging from 11-80% (Table A.1-28). Approximately 17-20% of the spill evaporates within 30 days.

However, at higher wind speeds (e.g., 10-15 m/s wind speed) and during summer, the slick would be dispersed and evaporated from the sea surface within a few days. Natural dispersion would take place if there was sufficient energy on the sea surface, such as breaking waves. The waves would break the oil slick into small droplets, typically with a diameter of 1–1000 μm (micrometers), which are mixed into the water masses (Reed et al., 2005). The largest droplets will resurface causing a thin monomolecular layer or sheen behind the main body of the oil spill. “Remaining” (in Table A.1-28) refers to the oil remaining after subtracting the above estimates from the total estimated release. Possible fates of the remaining oil include: remaining in the water column, settling to the sea floor, mixing with sediment, ingestion by microbes, or beaching on the shoreline with subsequent removal during shore cleanup activities or burial within the beach profile.

A-7.1.4. Very Large Oil Spill Conditional Probabilities

Assuming a hypothetical long-duration oil release occurs resulting in a VLOS, this section describes how the conditional probabilities for a large oil spill should be considered and applied for a VLOS, and where an offshore VLOS may go over longer time periods up to 110 days.

A large spill is modeled differently than a VLOS. A large spill would be represented by a single trajectory, while a VLOS of long duration would be represented by numerous trajectories, as described below.

In a large spill trajectory analysis, it is not estimated that any one trajectory brings oil to a particular location. Rather, the number of trajectories contacting an individual resource over the total number of trajectories launched is used to calculate the percent chance of a hypothetical large spill trajectory contacting that resource. For example, if 1,000 large oil spill trajectories are launched and 500 of the trajectories contact that location, there is a 50% chance of a large spill contacting that location.

A long duration VLOS would consist of a spill occurring continuously for up to 80 days and therefore this type of spill is more like a batch spill launched every day. In this case, there would be multiple trajectories over time with each trajectory launched regularly as the well continued to flow. Each trajectory would model how some fraction of the VLOS could spread to a specific resource or location. The multiple trajectories representing a VLOS would change how the conditional probabilities are interpreted. The conditional probabilities would represent how many trajectories come to that location, as described as percent trajectories (number of trajectories contacting a location/total number of trajectories launched). For example, if 1,000 trajectories are launched and 500 of the trajectories contact a specific location, then 50% of the trajectories would allow oil to be carried to that location. The terminology used hereafter is “percentage of trajectories contacting.”

Therefore, the conditional probabilities are used to provide information about both the large and very large spill; however the interpretation of the data changes as discussed above. Appendix A, Tables

A.2-24, 25, 29, 30, 34, 35, 39, 40, 44, 45, 49, 50, 54, 55, 59, and 60, which show summer and winter seasons within 30 and 110 days, are applicable to the VLOS conditional analysis.

A.1. Supporting Tables and Maps

Table A.1-1. Oil Spill Estimates: Phase, Activity and Source of Spill, Type of Oil, Number and Size of Spill, and Volume BOEM Assumes for Analysis in Cook Inlet Lease Sale 244 Action Area.

Phase	Type of Oil	Activity	Source of Spill	Number of Spill(s)[1]		Size of Spill(s) (in bbl)	Estimated Total Spill Volume
		Small Spills					
Exploration	**Diesel or Refined**	Geological and Geophysical Activities[2]	Offshore	0-6		<1 or one up to13 bbl	<18 bbl
		Exploration Plan Activities	Offshore and/or Onshore Operational Spills from All Sources	0-4		5 bbl or one up to 50 bbl	65 bbl
Development, Production and Decommissioning	**Crude, Condensate, Diesel or Refined Oil or Gas Release**	Development Plan Activities	Offshore and/or Onshore Operational Spills from all Sources	~450[1] Total			~300[1] bbl
				<1 bbl	432[1]	3 gallons	10 bbl
				1-<50 bbl	16	3 bbl	48 bbl
				50-<500 bbl	2	126 bbl	252 bbl
				500-<1,000 bbl	0	0 bbl	0 bbl
		Large Spills or Gas Releases					
		Development Plan Activities	Onshore Pipeline, or Offshore Pipeline, or Offshore Platform/Storage Tank/Well	Up to 1 from either		2,500 bbl, or 1,700 bbl, or 5,100 bbl	2,500 bbl, or 1,700 bbl, or 5,100 bbl
			Offshore Platform/Well	1 gas release		8 million ft^3	8 million ft^3

Note: [1] These numbers are for Alternatives 1, 3a, 3b, 3c, 4a, 4b, 5, or 6 and have been adjusted for rounding.
[2] Geophysical and Geotechnical Activities include Marine Seismic Surveys, Geohazard Surveys and Geotechnical Surveys.

Source: USDOI, BOEM, Alaska OCS Region (2015).

Table A.1-2. Land Segment (LS) ID and the Percent Type of Environmental Sensitivity Index Shoreline Closest to the Ocean for United States, Alaska Shoreline.

LS ID	Geographic Place Names	1A	2A	3A	4	5	6A	7	8A	9A	10A
1	Stepovak Bay, Kupreanof Peninsula, Ivanoff Bay	9	31	1	2	20	12	11	3	2	10
2	Jacob Island, Perryville	26	11	3	20	23	15	3	0	0	0
3	Mitrofania& Chiachi Island, Sosbee Bay	65	0	0	1	23	8	0	2	0	0
4	Mitrofania Bay, Stirni Point, Anchor Bay	24	10	0	21	6	18	4	4	0	13
5	Kuiukta Bay, Seal Cape	34	4	1	0	12	24	3	21	0	2
6	Warner Bay	11	5	0	0	12	24	4	35	4	5
7	Castle Bay, Chignik, Chignik Lagoon	1	17	0	0	16	13	22	6	15	10
8	Chignik Bay	4	32	1	0	22	21	9	1	9	0
9	Kujulik Bay, Unavikshak Island	8	29	1	0	24	6	28	1	3	0
10	Aniakchak Bay, Cape Kumlik, Kumlik Island	0	46	3	0	12	5	27	0	5	1
11	Amber Bay, Yantarni Bay	1	49	2	0	6	9	21	0	12	0
12	Nakalilok Bay, Ugaiushak Island	9	41	7	4	3	9	14	5	6	2
13	Cape Providence, Chiginagak Bay	15	19	0	0	17	23	14	4	8	0
14	Agripina Bay, Ashiiak Island, Cape Kilokak	15	14	1	0	21	11	6	1	28	4
15	Cape Kayakliut, Wide Bay	0	45	0	1	35	2	7	0	10	1
16	Capes Kanatak, Lgvak, and Unalishagvak, Portage Bay	12	40	0	1	19	4	5	1	18	0
17	Cape Aklek, Puale Bay	23	36	0	14	10	0	5	0	12	0
18	Alinchak Bay, Cape Kekurnoi, Bear Bay	5	28	0	1	14	0	17	0	34	1
19	Cape Kubugakli, Kashvik Bay, Katmai Bay	3	16	0	0	3	0	48	0	30	0
20	Amalik, Dakavak and Kinak Bays, Cape Iiktugitak, Takli Island	12	5	0	2	13	1	17	26	24	0
21	Kaflia Bay, Kukak Bay, Kuliak Bay, Missak Bay	10	9	0	0	25	1	3	11	37	3
22	Devils Cove, Hallo Bay	12	21	0	0	22	0	24	7	6	7
23	Cape Chiniak, Swikshak Bay	4	10	0	0	40	0	36	0	9	1
24	Fourpeaked Glacier	9	5	0	0	42	3	28	0	5	7
25	Cape Douglas, Sukoi Bay	0	46	1	1	28	0	10	4	10	1
26	Douglas River	0	23	0	0	15	0	52	5	0	6

LS ID	Geographic Place Names	1A	2A	3A	4	5	6A	7	8A	9A	10A
27	Akumwarvik Bay, McNeil Cove, Nordyke Island	0	26	0	0	1	0	3	8	47	15
28	Amakdedulia Cove, Bruin Bay, Chenik Head	0	29	0	0	18	2	13	15	24	0
29	Augustine Island	1	54	12	0	0	5	0	16	3	9
30	Rocky Cove, Tignagvik Point	0	31	0	4	22	4	9	10	1	20
31	Iiamna Bay, Iniskin Bay, Ursus Cove	2	28	0	0	21	2	0	8	39	0
32	Chinitna Point, Dry Bay	3	19	1	0	9	7	0	6	47	7
33	Chinitna Bay	4	10	0	2	17	14	23	0	25	5
34	Iliamna Point	1	0	0	4	12	1	28	0	12	42
35	Chisik Island, Tuxedni Bay	2	0	0	0	21	16	19	0	35	7
36	Redoubt Point	0	0	0	0	0	1	79	0	0	20
37	Drift River, Drift River Terminal	0	0	0	0	0	0	27	0	31	42
38	Kalgin Island	0	0	0	0	0	2	96	0	2	0
39	Seal River, Big River	0	0	0	0	0	0	0	0	54	46
40	Kustatan River,West Foreland	0	0	0	0	26	2	9	0	49	14
41	Chakachatna, McArthur & Middle River, Trading Bay	0	0	0	0	0	0	10	0	48	41
42	Beshta Bay	0	0	0	0	14	0	24	0	29	32
43	Tyonek, Chuitna River, Beluga	0	0	0	16	15	0	0	0	35	34
44	Beluga, Theodore, Lewis & Ivan Rivers	0	0	0	0	0	0	4	0	35	61
45	Susitna&Little Susitna Rivers, Big Island, Magot Point	0	0	0	3	0	0	11	0	26	60
46	Susitna Flats, Knik Arm	0	0	0	0	5	0	17	0	78	0
47	Fire Island	0	0	0	0	33	0	67	0	0	0
48	Anchorage, Turnagain Arm	0	0	0	0	15	0	85	0	0	0
49	Point Possession, Miller Creek	0	0	0	0	49	0	47	0	0	4
50	Moose Point, Otter Creek	0	46	0	0	0	0	26	0	0	28
51	Bishop Creek, Boulder Point, Swanson River	0	0	0	0	16	0	71	0	0	12
52	East Forelands, Kenai, Nikiski	0	0	0	61	34	0	6	0	0	0
53	Kalifornsky, Kasilof River, Kenai River	0	0	0	0	30	0	52	0	0	18
54	Clam Gulch, Kasilof	0	0	0	0	94	0	6	0	0	0
55	Deep Creek, Ninilchik, Ninilchik River	0	0	0	0	44	0	25	0	0	31
56	Cape Starichkof, Happy Valley	0	0	0	0	87	0	11	0	0	1
57	Anchor Point, Anchor River	0	0	0	0	45	0	55	0	0	0
58	Homer, Homer Spit	0	0	0	0	11	0	67	0	22	0
59	Fritz Creek, Halibut Cove	3	0	0	0	36	0	42	16	1	2
60	China Poot Bay, Gull Island	14	3	0	0	20	0	10	34	18	1
61	Barabara Point, Seldovia Bay	8	13	0	0	26	0	13	32	9	1
62	Nanwalek, Port Graham	7	32	0	0	31	1	8	8	10	3
63	Elizabeth Island, Port Chatham, Koyuktolik Bay	15	25	0	2	29	1	4	13	12	0
64	Chugach Bay, Rocky Bay, Windy Bay	24	18	0	0	17	0	0	22	19	0
65	West Arm Port Dick, Qikutulig Bay, Touglaalek Bay	17	13	0	0	11	2	0	47	10	1
66	Gore Point, Port Dick, Tonsina Bay	52	0	0	4	13	3	0	24	4	1
67	Nuka Passage, Nuka Bay, Nuka Island	30	0	0	1	8	2	5	49	4	1
68	Pye Islands, Surprise Bay	47	0	0	0	3	0	4	45	0	1
69	Black Bay, Thunder Bay, Two Arm Bay	26	0	0	0	24	1	3	44	0	2
70	Aialik Bay, Harris Bay	47	0	0	0	14	2	5	32	0	1
71	Aialik Cape, Aialik Bay, Resurrection Bay	52	0	0	0	25	1	0	22	0	0
72	Cape Resurrection, Day Harbor, Whidbey Bay	41	0	0	2	19	9	0	28	0	1
73	Johnstone Bay, Puget Bay	19	7	0	1	19	50	4	0	0	0
74	Elrington Island, Latouche Island	16	27	0	0	7	44	3	2	0	0
75	Montague Strait, Cape Clear	0	82	3	0	7	8	0	0	0	0
76	Monatgue Island (a)	6	42	5	0	7	35	4	0	0	0
77	Monatgue Island (b)	0	34	5	0	4	51	7	0	0	0
78	Monatgue Island (c)	0	27	0	0	2	60	8	0	0	2
79	Barren Islands, Ushagat Island	52	14	0	0	29	4	0	2	0	0
80	Amatuli Cove, East and West Amatuli Island	92	0	0	0	8	0	0	0	0	0
81	Shuyak Island	7	27	0	0	20	9	0	24	8	5
82	Bluefox Bay, Shuyak Island, Shuyak Strait	9	19	0	0	60	3	0	7	2	1
83	Foul Bay, Paramanof Bay	23	13	0	0	34	15	2	10	2	0
84	Malina Bay, Raspberry Island, Raspberry Strait	27	8	0	0	49	13	0	2	1	0
85	Kupreanof Strait, Viekoda Bay	22	21	0	0	39	19	0	0	0	0
86	Uganik Bay Uganik Strait, Cape Ugat	36	4	0	0	46	6	0	0	8	0

LS ID	Geographic Place Names	1A	2A	3A	4	5	6A	7	8A	9A	10A
87	Cape Kuliuk, Spiridon Bay, Uyak Bay	21	18	0	0	43	8	0	10	0	0
88	Karluk Lagoon, Northeast Harbor, Karluk	4	9	0	0	51	3	0	0	26	9
89	Halibut Bay, Middle Cape, Sturgeon Head	8	15	0	0	57	0	0	0	9	11
90	Ayakulik, Bumble Bay, Gurney Bay	26	14	0	0	50	1	0	0	8	1
91	Low Cape, Sukhoi Bay	0	3	0	0	43	0	0	32	23	0
92	Aiaktalik, Alitak Bay, Cape Alitak	7	19	0	0	26	1	0	15	27	4
93	Sitkinak Island	0	10	0	0	38	2	19	28	4	0
95	Tugidak Island	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
96	Chirikof Island	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
94	Semidi Islands	0	0	0	0	47	0	17	36	0	0
97	Sutwik Island	11	17	0	0	53	20	0	0	0	0
98	Aiaktalik Island, Japanese Bay, Kaguyak Bay, Russian Harbor	0	26	0	0	55	0	0	18	0	1
99	Kiavak Bay, Knoll Bay, Natalia Bay, Rolling Bay	14	31	2	0	24	4	0	20	5	0
100	McCord Bay, Newman Bay, Ocean Bay, Sitkalidak Island, Sitka	2	15	0	0	54	5	3	12	4	4
101	Boulder Bay, Outer Right Cape, Kiluida Bay	3	28	0	0	45	16	0	2	5	1
102	Gull Point, Pasagshak Bay, Ugak Bay	0	43	2	1	17	21	0	16	0	1
103	Barry Lagoon, Cape Chiniak, Cape Greville	3	40	0	0	0	0	0	57	0	0
104	Long Island, Chiniak Bay	9	32	0	2	0	2	0	42	9	3
105	Anton Larsen Bay, Narrow Strait, Kodiak, Spruce Island, Spruce Cape	1	26	0	0	8	11	0	50	3	0
106	Afognak Strait, Whale Island, Kizhuyak&Sharatin Bay	14	46	0	0	9	20	0	11	0	0
107	Kazakof Bay, Duck Bay	24	0	0	0	5	18	0	53	0	0
108	Izhut Bay, Pillar Cape	24	0	0	0	4	9	0	62	0	0
109	King Cove, Tonki Cape Peninsula	26	9	0	0	17	6	0	41	0	0
110	Marmot Cape, Marmot Island, Marmot Strait	23	32	0	0	13	32	0	0	0	0
111	Seal Bay, Tonki Bay	0	27	0	0	0	14	0	58	1	0
112	Andreon Bay, Big Fort Island, Big Waterfall Bay, Perenosa Bay	16	14	0	0	3	22	0	45	0	0

Source: USDOI, BOEM, Alaska OCS Region (2015) from USDOC NOAA, 1997, 2002, 2004.
Key: ND = no data

ID = identification (number). Number Description		
1A Exposed rocky cliffs	5 Mixed sand and gravel beaches	9A Sheltered tidal flats
2A Wavecut Bedrock Mud Clay Rocky Shoals	6A Gravel Beaches	10A Salt- and brackish-water marshes
3A Fine- to medium-grained sand beaches	7 Exposed tidal flats	
4 Coarse-grained sand beaches	8A Sheltered scarps in bedrock, mud, or clay	

Table A.1-3. Fate and Behavior of a Hypothetical 5,100-Barrel Diesel Oil Spill from a Platform in the Cook Inlet OCS.

	Summer Spill[1]				Winter Spill[2]				Winter Spill (Broken Ice)[2]			
Time After Spill in Days	1	3	10	30	1	3	10	30	1	3	10	30
Oil Remaining (%)	54	6	0	na	18	0	na	na	77	36	0	na
Oil Dispersed (%)	33	73	76	na	69	84	na	na	10	36	63	na
Oil Evaporated (%)	13	23	24	na	13	16	na	na	13	28	37	na

Source: USDOI, BOEM, Alaska OCS Region (2015).
Note: Calculated with the SINTEF oil-weathering model Version 4.0 of Reed et al. (2005) and assuming Marine Diesel.
[1] Summer (April 1-October 31), 12-knot wind speed, 9 degrees Celsius, 1-meter wave height. Average Marine Weather Area A (Brower et al., 1988)
[2] Winter Spill (November 1-March 31), 16-knot wind speed, 5 degrees Celsius, 1.8- meter wave heights and for Broken Ice 50% ice Average Marine Weather Area A (Brower et al., 1988)
na means not applicable.

Table A.1- 4. Fate and Behavior of a Hypothetical 5,100-Barrel Crude Oil Spill from a Platform in the Cook Inlet OCS.

	Summer Spill[1]				Winter Spill[2]				Winter Spill (Broken Ice)[2]			
Time After Spill in Days	1	3	10	30	1	3	10	30	1	3	10	30
Oil Remaining (%)	87	75	54	24	80	57	23	3	89	84	76	61
Oil Dispersed (%)	3	13	30	56	10	30	61	80	1	3	8	19
Oil Evaporated (%)	10	13	16	20	10	13	16	17	10	13	16	20
Discontinuous Area (km2)[3, 4]	14	59	279	1,159	14	58	278	1,153	14	58	278	1,153
Estimated Coastline Oiled (km) [5]	40				30				30			

Note: Notes following Table A.1-5 apply.

Table A.1- 5. Fate and Behavior of a Hypothetical 1,700-Barrel Crude Oil Spill from a Pipeline in the Cook Inlet OCS.

	Summer Spill[1]				Winter Spill[2]				Winter Spill (Broken Ice)[2]			
Time After Spill in Days	1	3	10	30	1	3	10	30	1	3	10	30
Oil Remaining (%)	86	75	54	24	77	56	23	3	89	86	79	67
Oil Dispersed (%)	4	12	30	56	12	31	61	80	1	2	6	14
Oil Evaporated (%)	10	13	16	20	11	13	16	17	10	12	15	19
Discontinuous Area (km^2)[3, 4]	8	34	159	662	8	33	82	658	8	33	82	658
Estimated Coastline Oiled (km)[5]	24				17				17			

Notes: Calculated with the SINTEF oil-weathering model Version 4.0 of Reed et al. (2005) and assuming a Medium Crude Oil of 20-25° API

[1] Summer (April 1-October 31), 12-knot wind speed, 9 degrees Celsius, 1-meter wave height. Average Marine Weather Area A (Brower et al., 1988)

[2] Winter Spill (November 1-March 31), 16-knot wind speed, 5 degrees Celsius, 1.8- meter wave heights and for Broken Ice 50% ice. Average Marine Weather Area A (Brower et al., 1988)

[3] This is the discontinuous area of oiled surface.

[4] Calculated from Equation 6 of Table 2 in Ford (1985) and is the discontinuous area of a continuing spill or the area swept by an instantaneous spill of a given volume. Note that ice dispersion occurs for about 30 days before meltout.

[5] Calculated from Equation 17 of Table 4 in Ford (1985) and is the result of stepwise multiple regressions for length of historical coastline affected.

Source: USDOI, BOEM, Alaska OCS Region (2015).

Table A.1- 6. Identification Number (ID) and Name of Environmental Resource Areas, Represented in the Oil-Spill Trajectory Model and Their Location on Environmental Resource Area Maps and Tables.

ID	NAME	GENERAL RESOURCE	MAP	Table A.1-
1	SUA: Tyonek Beluga	Subsistence	A-2a	11
2	SUA: Tyonek North	Subsistence	A-2a	11
3	SUA: Tyonek South	Subsistence	A-2a	11
4	SUA: Seldovia, Port Graham, Nanwalek	Subsistence	A-2a	11
5	SUA: Port Lions	Subsistence	A-2d	11
6	SUA: Ouzinke	Subsistence	A-2d	11
7	SUA: Larsen Bay	Subsistence	A-2d	11
8	SUA: Karluk	Subsistence	A-2d	11
9	SUA: Akhiok	Subsistence	A-2d	11
10	SUA: Old Harbor	Subsistence	A-2d	11
11	Augustine	Marine Mammals, Lower Trophic Level Organisms	A-2a	9, 13
12	South Cook HS 1a	Marine Mammals	A-2a	9
13	South Cook HS 1b	Marine Mammals	A-2a	9
14	South Cook HS 1c	Marine Mammals	A-2a	9
15	South Cook HS 1d	Marine Mammals	A-2a	9
16	Inner Kachemak Bay	Marine Mammals	A-2b	9
17	Clam Gulch HS	Marine Mammals	A-2a	9
18	Tuxedni HS	Marine Mammals	A-2a	9
19	Kalgin Island HS	Marine Mammals	A-2a	9
20	Redoubt Bay HS	Marine Mammals	A-2b	9
21	Trading Bay HS	Marine Mammals	A-2b	9
22	Susitna Flats HS	Marine Mammals	A-2a	9
23	Barren Is. Pinniped	Marine Mammals	A-2b	9
24	Shelikof MM 2	Marine Mammals, Whales	A-2d	9, 8
25	Shelikof MM 3	Marine Mammals, Whales	A-2d	9, 8
26	Shelikof MM 4	Marine Mammals, Whales	A-2d	9, 8
27	Shelikof MM 5	Marine Mammals, Whales	A-2d	9, 8
28	Shelikof MM 6	Marine Mammals	A-2d	9
29	Shelikof MM 7	Marine Mammals	A-2d	9
30	Shelikof MM 8	Marine Mammals	A-2d	9
31	Kodiak Pinniped 1	Marine Mammals	A-2e	9
32	Kodiak Pinniped 2	Marine Mammals	A-2e	9
33	Kodiak Pinniped 3	Marine Mammals	A-2e	9
34	Kodiak Pinniped 4	Marine Mammals	A-2e	9
35	Kodiak Pinniped 5	Marine Mammals	A-2e	9
36	Kodiak Pinniped 6	Marine Mammals	A-2e	9
37	Port Chatham Pinniped	Marine Mammals	A-2b	9
38	Port Dick Pinniped	Marine Mammals	A-2b	9
39	Two-Arm Bay Pinniped	Marine Mammals	A-2b	9
40	Nuka Bay Pinniped	Marine Mammals	A-2c	9
41	Resurrection/Chiswell	Marine Mammals, Whales	A-2c	9, 8
42	Cape Puget Pinniped	Marine Mammals	A-2c	9
43	AK Peninsula Pinniped 1	Marine Mammals	A-2h	9
44	AK Peninsula Pinniped 2	Marine Mammals	A-2h	9
45	Clam Gulch	Marine Mammals	A-2a	10
46	Outer Kachemak Bay	Marine Mammals	A-2b	10
47	SW Cook Inlet	Marine Mammals	A-2b	10
48	Kamishak Bay	Marine Mammals	A-2b	10
49	Katmai NP	Marine Mammals	A-2e	10
50	Becharof NWR	Marine Mammals	A-2e	10
51	Alaska Peninsula NWR- N	Marine Mammals	A-2f	10
52	Aniakchak NM&P	Marine Mammals	A-2h	10
53	Alaska Peninsula NWR South	Marine Mammals	A-2h	10
54	Sutwick Island	Marine Mammals	A-2h	10
55	Semidi Islands	Marine Mammals	A-2h	10
56	Chirikof Island	Marine Mammals	A-2h	10
57	Trinity Islands	Marine Mammals	A-2e	10
58	Kodiak NWR-east	Marine Mammals	A-2e	10

ID	NAME	GENERAL RESOURCE	MAP	Table A.1-
59	Kodiak NWR-south	Marine Mammals	A-2e	10
60	Kodiak NWR-west	Marine Mammals	A-2e	10
61	NE Kodiak	Marine Mammals	A-2e	10
62	Chiniak Bay	Marine Mammals	A-2e	10
63	Ugak Bay	Marine Mammals	A-2e	10
64	Afognak-west	Marine Mammals	A-2e	10
65	Afognak-north	Marine Mammals	A-2e	10
66	Afognak-east	Marine Mammals	A-2e	10
67	Shuyak	Marine Mammals	A-2e	10
68	Kenai Fjords-west	Marine Mammals	A-2b	10
69	Upper Cook Inlet- Beluga CH	Whales	A-2a	8
70	Forelands- Beluga CH	Whales	A-2a	8
71	Middle Cook Inlet-Beluga CH	Whales	A-2b	8
72	West Cook Inlet-Beluga CH	Whales	A-2b	8
73	NPRW Feeding Area	Whales	A-2f	8
74	NPRW CH	Whales	A-2d	8
75	Kachemak- Humpback Whale	Whales	A-2c	8
76	Shelikof- Humpback Whale	Whales	A-2f	8
77	N Kodiak- Humpback Whale	Whales	A-2c	8
78	E Kodiak- Humpback Whale	Whales	A-2f	8
79	S Kodiak- Humpback Whale	Whales	A-2f	8
80	Shelikof MM 1	Whales	A-2d	8
81	Shelikof MM 1a	Whales	A-2d	8
82	Shelikof MM 2a	Whales	A-2d	8
83	Shelikof MM 3a	Whales	A-2d	8
84	Shelikof MM 4a	Whales	A-2d	8
85	Shelikof MM 5a	Whales	A-2d	8
86	Shelikof MM 6a	Whales	A-2d	8
87	Shelikof MM 9	Whales	A-2d	8
88	Shelikof MM 10	Whales	A-2h	8
89	Shelikof MM 11	Whales	A-2h	8
90	Barren Islands- Fin Whale	Whales	A-2f	8
91	NE Kodiak- Fin Whale	Whales	A-2f	8
92	Kodiak- Gray Whale Feeding	Whales	A-2g	8
93	Upper E Kenai- Gray Whale	Whales	A-2c	8
94	Lower E Kenai- Gray Whale	Whales	A-2c	8
95	NE Kodiak- Gray Whale	Whales	A-2g	8
96	E Kodiak- Gray Whale	Whales	A-2g	8
97	SE Kodiak- Gray Whale	Whales	A-2f	8
98	Shelikof- Gray Whale	Whales	A-2g	8
99	N Shumagin- Gray Whale	Whales	A-2h	8
100	S Shumagin- Gray Whale	Whales	A-2h	8
101	Cook Inlet 1- Harbor Porpoise	Whales	A-2a	8
102	Cook Inlet 2- Harbor Porpoise	Whales	A-2a	8
103	Cook Inlet 3- Harbor Porpoise	Whales	A-2c	8
104	Cook Inlet 4- Harbor Porpoise	Whales	A-2c	8
105	Cook Inlet 5- Harbor Porpoise	Whales	A-2b	8
106	SE Kodiak- Harbor Porpoise	Whales	A-2e	8
107	S Kodiak- Harbor Porpoise	Whales	A-2g	8
108	Shelikof- Killer Whale	Whales	A-2e	8
109	E Kodiak- Killer Whale	Whales	A-2e	8
110	SE Kenai- Dall's Porpoise	Whales	A-2c	8
111	NW Afognak Is IBA	Birds	A-2c	7
112	Uganik and Viekoda Bay IBAs	Birds	A-2d	7
113	Marmot Bay/ Colonies IBAs	Birds	A-2c	7
114	Chiniak Bay IBA	Birds	A-2d	7
115	Ugak Bay: Birds	Birds	A-2d	7
116	Eastern Kodiak Is IBA	Birds	A-2d	7
117	Flat Is Colony IBA	Birds	A-2d	7
118	Sitkinak Strait STEI Habitat	Birds	A-2d	7

ID	NAME	GENERAL RESOURCE	MAP	Table A.1-
119	Gulf of Alaska Shelf IBA	Birds	A-2f	7
120	Chirikof Is Marine IBA	Birds	A-2f	7
121	Semidi Islands Colonies IBA	Birds	A-2h	7
122	Semidi Islands Marine IBA	Birds	A-2h	7
123	Spitz Is Colony IBA	Birds	A-2h	7
124	Seal Cape Marine IBA	Birds	A-2h	7
125	Chignik Bay Vicinity: Birds	Birds	A-2h	7
126	Ugaiushak Is Colonies IBA	Birds	A-2g	7
127	Wide Bay IBA	Birds	A-2g	7
128	Wide Bay STEI Habitat	Birds	A-2g	7
129	Cape Unalishagvak Vicinity: Birds	Birds	A-2g	7
130	South Alinchak Bay Colony	Birds	A-2g	7
131	Katmai Bay Colonies	Birds	A-2g	7
132	Amalik Bay Colonies IBA	Birds	A-2g	7
133	Ninagiak Is Colonies	Birds	A-2g	7
134	Kiukpalik Is Colony	Birds	A-2g	7
135	Shaw Is Colony	Birds	A-2g	7
136	Kamishak Bay IBA	Birds	A-2b	7
137	Kamishak Bay STEI Habitat	Birds	A-2b	7
138	Tuxedni Is Colony IBA	Birds	A-2c	7
139	Tuxedni Bay IBA	Birds	A-2c	7
140	Redoubt Bay IBA	Birds	A-2b	7
141	Trading Bay IBA	Birds	A-2b	7
142	Susitna Flats IBA	Birds	A-2b	7
143	Anchorage Coastal IBA	Birds	A-2b	7
144	Clam Gulch STEI Habitat.	Birds	A-2c	7
145	Outer Kachemak Bay/IBA	Birds, Marine Mammals	A-2a	7, 10
146	Lower Cook Inlet 153W59N IBA	Birds	A-2b	7
147	Barren Islands Marine IBA	Birds	A-2b	7
148	Barren Islands Colonies IBA	Birds	A-2a	7
149	SW Kenai Pen Marine IBA	Birds	A-2a	7
150	Kenai Fjords	Birds	A-2c	7
151	Gulf of AK Shelf 151W58N IBA	Birds	A-2c	7
152	Gulf of AK Shelf Edge 148W59N	Birds	A-2c	7
153	Polly Creek Beach	Lower Trophic Level Organisms	A-2a	13
154	Chinitna Bay	Lower Trophic Level Organisms	A-2a	13
155	Barren Islands	Lower Trophic Level Organisms	A-2a	13

Key: AK = Alaska, CH = Critical Habitat, E = East, HS = Harbor seal, IBA = Important Bird Area, Is = Island, MM = Marine Mammal, N= North, NE= Northeast, NM&P = National Monument and Park, NP= National Park, NPRW = North Pacific Right Whale, NW = Northwest, NWR = National Wildlife Refuge, Pen = Peninsula, S = South, STEI = Steller's Eider, SUA = Subsistence Use Area, SW = Southwest, W=West
Source: USDOI, BOEM, Alaska OCS Region (2015).

Table A.1-7. Environmental Resource Areas Used in the Analysis of Large or Very Large Oil Spill Effects on Birds.

ID	Name	Map	Vulnerable	Specific Resource	Reference
ERA ID					
111	NW Afognak Is IBA	A-2c	May-August	BLKI (Seabird Colony), BLOY	Audubon Alaska, 2015.
112	Uganik And Viekoda Bay IBAs	A-2d	May-August	BLKI (Seabird Colony), BLOY (Criteria B1), KIMU (Criteria A1), MAMU (Criteria A1)	Audubon Alaska, 2015.
113	Marmot Bay/Colonies IBAs	A-2c	January-December	Seabird Colonies: BLKI, TUPU, FTSP; Wintering Area: BLSC	Audubon Alaska, 2015.
114	Chiniak Bay IBA	A-2d	January-December	STEI Wintering Habitat Area. Wintering Habitat Also For EMGO, YBLO; Seabird Colonies: BLKI and Others	Audubon Alaska, 2015; Lance, 2014; Larned, Anderson, and Corcoran, 2010; Larned and Zweifelhofer, 2002.
115	Ugak Bay: Birds	A-2d	November-April	STEI Wintering Habitat Area	Lance, 2014; Larned, Anderson, and Corcoran, 2010; Larned and Zweifelhofer, 2002.
116	Eastern Kodiak Is IBA	A-2d	January-December	Open Water Habitat (WWSC). Seabird Colonies: BLKI, Others.	Audubon Alaska, 2015.
117	Flat Is Colony IBA	A-2d	May-August	TUPU (Seabird Colony).	Audubon Alaska, 2015.
118	Sitkinak Strait STEI Habitat	A-2d	November-April	STEI Wintering Area	Lance, 2014; Larned, Anderson, and Corcoran, 2010; Larned and Zweifelhofer, 2002.
119	Gulf Of Alaska Shelf IBA	A-2f	May-August	CAAU (Foraging)	Audubon Alaska, 2015.
120	Chirikof Is Marine IBA	A-2f	May-August	HOPU (Seabird Colony & Foraging)	Audubon Alaska, 2015.
121	Semidi Islands Colonies IBA	A-2h	May-August	Seabird Colonies: NOFU, HOPU, Numerous Species	Audubon Alaska, 2015.
122	Semidi Islands Marine IBA	A-2h	May-August	Seabird Foraging: HOPU.	Audubon Alaska, 2015.
123	Spitz Is Colony IBA	A-2h	May-August	Seabird Colonies: BLKI	Audubon Alaska, 2015.
124	Seal Cape Marine IBA	A-2h	May-August	Seabird Colonies: HOPU. Foraging: HOPU, GWGU	Audubon Alaska, 2015
125	Chignik Bay Vicinity: Birds	A-2h	January-December	STEI Wintering Area; Seabird Colonies: BLKI, TUPU, COMU. Wintering:	Audubon Alaska, 2015; Lance, 2014.
126	Ugaiushak Is Colonies IBA	A-2g	May-August	Seabird Colonies: HOPU, TUPU, RFCO, BLKI	Audubon Alaska, 2015.
127	Wide Bay IBA	A-2g	May-August	Seabird Colonies: RFCO. BLOY.	Audubon Alaska, 2015.
128	Wide Bay STEI Habitat	A-2g	November-April	STEI Wintering Area	Lance, 2014.
129	Cape Unalishagvak Vicinity: Birds	A-2g	May-August	Seabird Colonies: UNMU, BLKI.	USGS, 2014.
130	South Alinchak Bay Colony	A-2g	May-August	Seabird Colony: TUPU	USGS, 2014.
131	Katmai Bay Colonies	A-2g	May-August	Seabird Colonies: GWGU, PECO	USGS, 2014.
132	Amalik Bay Colonies IBA	A-2g	May-August	Seabird Colonies: RFCO, UNCO	Audubon Alaska, 2015.
133	Ninagiak Is Colonies	A-2g	May-August	Seabird Colonies: TUPU, HOPU, GWGU	USGS, 2014.
134	Kiukpalik Is Colony	A-2g	May-August	Seabird Colony: GWGU	USGS, 2014.
135	Shaw Is Colony	A-2g	May-August	Seabird Colony: GWGU	USGS, 2014.
136	Kamishak Bay IBA	A-2b	May-August	Seabird Colonies: GWGU, Others	Audubon Alaska, 2015.
137	Kamishak Bay STEI Habitat	A-2b	November-April	STEI Wintering Area	Lance, 2014; Larned, 2006; Rosenberg, 2007, pp. 3.
138	Tuxedni Is Colony IBA	A-2c	May-August	Seabird Colonies: BLKI, COMU, HOPU, GWGU, Others	Audubon Alaska, 2015.
139	Tuxedni Bay IBA	A-2c	July-April	Shorebird Migration Stopover: WESA. Waterfowl Migration Stopover: CAGO. Waterfowl Molting: SUSC, WWSC.	Audubon Alaska, 2015.
140	Redoubt Bay IBA	A-2b	January-December	Shorebird Migration Stopover. Waterfowl Migration Stopover And Breeding Area: Tule WF Geese And Others.	Audubon Alaska, 2015.
141	Trading Bay IBA	A-2b	January-December	Waterfowl Migration Stopover And Breeding Area: Wrangell Is SNGO And Others. Shorebird Wintering: ROSA	Audubon Alaska, 2015.
142	Susitna Flats IBA	A-2b	January-December	Waterfowl Migration Stopover And Breeding Area: Many Species. Shorebird Wintering: ROSA	Audubon Alaska, 2015.
143	Anchorage Coastal IBA	A-2b	March-October	Waterfowl Migration Area: SNGO And SACR.	Audubon Alaska, 2015.
144	Clam Gulch STEI Habitat.	A-2a	November-April	STEI Wintering Area	Lance, 2014; Rosenberg, 2007, Fig 1.
145	Outer Kachemak Bay/IBA	A-2a	January-December	Seabird And Seaduck Wintering; Waterfowl And Shorebird Migration Stopover; Seabird Foraging - MAMU	Audubon Alaska, 2015.
146	Lower Cook Inlet 153W59N IBA	A-2c	November-April	Foraging – GWGU	Audubon Alaska, 2015.
147	Barren Islands Marine IBA	A-2b	May-August	Foraging-TUPU	Audubon Alaska, 2015.

ID	Name	Map	Vulnerable	Specific Resource	Reference
148	Barren Islands Colonies IBA	A-2a	May-August	Seabird Colonies – TUPU, FTSP, BLKI, COMU, RHAU, GWGU, PECO, HOPU, Etc.	Audubon Alaska, 2015.
149	SW Kenai Pen Marine IBA	A-2a	May-August	Seabird Colonies – TUPU, Etc.	Audubon Alaska, 2015.
150	Kenai Fjords	A-2c	May-August	Seabird Colonies-BLKI, TUPU, RHAU, GWGU	Audubon Alaska, 2015.
151	Gulf of AK Shelf 151W58N IBA	A-2c	January-December	Foraging- GWGU	Audubon Alaska, 2015.
152	Gulf of AK Shelf Edge 148W59N	A-2c	January-December	Foraging-BFAL, GWGU	Audubon Alaska, 2015.
LS ID					
1	Ivanof Bay IBA	A-3a	January-December	Seabird Colonies: TUPU. Wintering: EMGO.	Audubon Alaska, 2015.
53	Kenai River Flats IBA	A-3c	March-October	Waterfowl Migration Area: SNGO, SACR, Others.	Audubon Alaska, 2015.
53	Kasilof River Flats IBA	A-3c	July-April	Shorebird Wintering: ROSA; Waterfowl Migration Stopover.	Audubon Alaska, 2015.
59	Fox River Flats IBA	A-3c	July-April	Shorebird and Waterfowl Migration Stopover; WESA; TRSW	Audubon Alaska, 2015.
87	Uyak Bay	A-3b	May-August	BLKI (Seabird Colony),	USGS, 2014.
GLS ID					
148	Prince William Sound IBA	A-4b	January-December	Seabird Colonies-BLKI, Etc. Molting-HADU, Etc.	Audubon Alaska, 2015.

Key: IBA= Important Bird Area; Black-footed Albatross (BFAL), Black-legged Kittiwake (BLKI), Black Oystercatcher (BLOY), Black Scoter (BLSC), Cassin's Auklet (CAAU), Common Murre (COMU), Emperor Goose (EMGO), Fork-tailed Storm-Petrel (FTSP), Glaucous-winged Gull (GWGU), Harlequin Duck (HADU), Horned Puffin (HOPU), Kittlitz's Murrelet (KIMU), Marbled Murrelet (MAMU), Northern Fulmar (NOFU), Pelagic Cormorant (PECO), Red-faced Cormorant (RFCO), Rhinoceros Auklet (RHAU), Rock Sandpiper (ROSA), Sandhill Crane (SACR), Snow Goose (SNGO): Surf Scoter (SUSC), Tufted Puffin (TUPU), STEI (Steller's Eider), Surf Scoter (SUSC), Western Sandpiper (WESA), White-winged Scoter (WWSC) (Pyle and DeSante, 2014).

Source: USDOI, BOEM, Alaska OCS Region (2015).

Table A.1-8. Environmental Resource Areas Used in the Analysis of Large or Very Large Oil Spill Effects on Marine Mammals (Whales).

ERA ID	Name	Map	Vulnerable	Specific Resource	Reference
16	Inner Kachemak Bay	A-2b	January-December	Beluga Whale, CH	Ashford, Ezer, and Jones, 2013; Ezer, Hobbs, and Oey, 2008; Ezer et al., 2013; 76 *FR* 20180, April 11, 2011; Hobbs et al., 2005; Laidre et al., 2000; Moore and DeMaster, 2000; Hobbs, Rugh, and DeMaster, 2000; Rugh, Mahoney, and Smith, 2004; Rugh, Shelden, and Mahoney, 2000; Shelden et al., 2012, 2013; Speckman and Piatt, 2000.
24	Shelikof MM 2	A-2d	January-December	Fin Whale	Brueggeman et al., 1987, 1988; Consiglieri et al., 1982; Hanson and Hubbard, 1999; Leatherwood, Bowles, and Reeves, 1983; Manly, 2007; NMML,1991, 1992, 1993, 1998, 2001, 2003a, 2003b, 2012; Rice and Wolman, 1981; Rugh et al., 2005a, 2005b; Shelden et al., 2013; Speckman, 2002; Waite, 2003; Waite et al., 1999; Witteveen and Wynne, 2012, 2013; Witteveen et al., 2014; Wynne, Foy, and Buck, 2011; Zerbini, Waite, and Wade, 2006.
25	Shelikof MM 3	A-2d	January-December	Fin Whale	Same as ERA 24.
26	Shelikof MM 4	A-2d	January-December	Fin Whale	Same as ERA 24.
27	Shelikof MM 5	A-2d	January-December	Fin Whale	Same as ERA 24.
28	Shelikof MM 6	A-2d	January-December	Fin Whale,	Same as ERA 24.
30	Shelikof MM 8	A-2d	January-December	Fin Whale	Same as ERA 24.
41	Resurrection- Killer Whale	A-2c	January-December	Killer Whale	Brueggeman et al., 1988; Consiglieri et al., 1982; Hansen and Hubbard, 1999; Leatherwood, Bowles, and Reeves, 1983; Matkin et al., 2012; NMML, 1998, 2001, 2003a, 2003b, 2012; Rice and Wolman, 1981; Rone, 2014; Rone et al., 2010; Rugh et al., 2005a, 2005b; Shelden et al., 2013; Speckman, 2002; Zerbini et al., 2007.
69	Upper Cook Inlet- Beluga CH	A-2a	January-December	Beluga Whale, CH	Same as ERA 16.
70	Forelands- Beluga CH	A-2a	January-December	Beluga Whale, CH	Same as ERA 16.
71	Middle Cook Inlet -Beluga CH	A-2b	January-December	Beluga Whale, CH	Same as ERA 16.
72	West Cook Inlet- Beluga CH	A-2b	January-December	Beluga Whale, CH	Same as ERA 16.
73	NPRW Feeding Area	A-2f	June-September	North Pacific Right Whale	Ferguson et al., 2015.
74	NPRW CH	A-2d	June-December	North Pacific Right Whale, CH	73 *FR* 19000, April 8, 2008

ERA ID	Name	Map	Vulnerable	Specific Resource	Reference
75	Kachemak- Humpback Whale	A-2c	May-December	Humpback Whale	Braham, 1984; Bruggeman et al., 1987, 1988; Consiglieri et al., 1982; Calambokidis et al., 2008; Dahlheim, 1994; Ferguson et al., 2015; Leatherwood, Bowles, and Reeves, 1983; Manly, 2007; NMML, 1991, 1993,1998, 2003a, 2003b, 2012; Rice and Wolman, 1981; Rugh et al., 2005a, 2005b; Shelden et al., 2013; Speckman, 2002; Waite, 2003; Waite et al., 1999; Witteveen and Wynne, 2012; Witteveen et al., 2007, 2008, 2011a, 2011b, 2014; Zerbini, Waite, and Wade, 2006.
76	Shelikof- Humpback Whale	A-2f	May-December	Humpback Whale	Braham, 1984; Bruggeman et al., 1987, 1988; Consiglieri et al., 1982; Calambokidis et al., 2008; Dahlheim, 1994; Ferguson et al., 2015; Leatherwood, Bowles, and Reeves, 1983; Manly, 2007; NMML, 1992, 1993, 1998, 2003a, 2003b, 2012; Rice and Wolman, 1981; Rugh et al., 2005a, 2005b; Shelden et al., 2013; Speckman, 2002; Waite, 2003; Waite et al., 1999; Witteveen and Wynne, 2012; Witteveen et al., 2007, 2008, 2011a, 2011b, 2014; Wright et al., 2015; Wynne, Foy, and Buck 2011; Zerbini, Waite, and Wade, 2006.
77	N Kodiak- Humpback Whale	A-2c	May-December	Humpback Whale	Same as ERA 76 excepting NMML, 2003a.
78	E Kodiak- Humpback Whale	A-2f	May-December	Humpback Whale	Same as ERA 76.
79	S Kodiak- Humpback Whale	A-2f	May-December	Humpback Whale	Same as ERA 76 excepting NMML, 2003a.
80	Shelikof MM 1	A-2d	January-December	Fin Whale	Brueggeman et al., 1987, 1988; Consiglieri et al., 1982; Hanson and Hubbard, 1999; Leatherwood, Bowles, and Reeves, 1983; Manly, 2007; NMML,1991, 1992, 1993, 1998, 2003a, 2003b, 2012; Rice and Wolman, 1981; Rugh et al., 2005a, 2005b; Shelden et al., 2013; Speckman, 2002; Waite, 2003; Waite et al., 1999; Witteveen and Wynne, 2012, 2013; Witteveen et al., 2014; Wynne, Foy, and Buck, 2011; Zerbini, Waite, and Wade, 2006
81	Shelikof MM 1a	A-2d	June-August	Dall’s Porpoise	Brueggeman et al., 1987, 1988; Consiglieri et al., 1982; Hansen and Hubbard, 1999; Leatherwood, Bowles, and Reeves, 1983; Manly, 2007; NMML, 1992, 1993, 1998, 2003a, 2003b, 2012; Rice and Wolman, 1981; Rugh et al., 2005a; Shelden et al., 2013; Speckman, 2002; Witteveen and Wynne, 2012, 2013.
82	Shelikof MM 2a	A-2d	June-August	Dall’s Porpoise	Same as ERA 81.
83	Shelikof MM 3a	A-2d	June-August	Dall’s Porpoise	Same as ERA 81.
84	Shelikof MM 4a	A-2d	June-August	Dall’s Porpoise	Same as ERA 81.
85	Shelikof MM 5a	A-2d	June-August	Dall’s Porpoise	Same as ERA 81.
86	Shelikof MM 6a	A-2d	June-August	Dall’s Porpoise	Same as ERA 81.
87	Shelikof MM 9	A-2d	June-August	Dall’s Porpoise	Same as ERA 81.
88	Shelikof MM 10	A-2h	June-August	Dall’s Porpoise	Same as ERA 81.
89	Shelikof MM 11	A-2h	January-December	Fin Whale	Same as ERA 80.
90	Barren Islands- Fin Whale	A-2f	January-December	Fin Whale	Same as ERA 80.
91	NE Kodiak- Fin Whale	A-2f	January-December	Fin Whale	Same as ERA 80.
92	Kodiak- Gray Whale Feeding	A-2g	June-August	Gray Whale	Braham, 1984; Brueggeman et al., 1987; Consiglieri et al., 1982; Cowen et al., 1987; Ferguson et al., 2015; Leatherwood, Bowles, and Reeves, 1983; Moore et al., 2007; NMML, 1992, 1993, 1998, 2003a, 2012; Rugh et al., 2005a, 2005b; Shelden et al., 2013; Witteveen and Wynne, 2012, 2013.
93	Upper E Kenai- Gray Whale	A-2c	April-December	Gray Whale	Braham, 1984; Brueggeman et al., 1987; Consiglieri et al., 1982; Cowen et al., 1987; Ferguson et al., 2015; Leatherwood, Bowles, and Reeves, 1983; Moore et al., 2007; NMML, 1992, 1998, 2003a, 2003b, 2009, 2012, 2013; Rone, 2014; Rone et al., 2010; Rugh et al., 2005a, 2005b; Shelden et al., 2013.
94	Lower E Kenai- Gray Whale	A-2c	April-December	Gray Whale	Same as ERA 93.
95	NE Kodiak- Gray Whale	A-2g	April-December	Gray Whale	Braham, 1984; Brueggeman et al., 1987; Consiglieri et al., 1982; Cowen et al., 1987; Ferguson et al., 2015; Leatherwood, Bowles, and Reeves, 1983; Moore et al., 2007; NMML, 1992, 1993,1998, 2003a, 2003b, 2012; Rugh et al., 2005a, 2005b; Shelden et al., 2013; Witteveen and Wynne, 2012, 2013; Wynne, Foy, and Buck, 2005.
96	E Kodiak- Gray Whale	A-2g	April-December	Gray Whale	Same as ERA 95.
97	SE Kodiak- Gray Whale	A-2f	April-December	Gray Whale	Same as ERA 95.
98	Shelikof- Gray Whale	A-2g	April-December	Gray Whale	Same as ERA 95.
99	N Shumagin- Gray Whale	A-2h	April-December	Gray Whale	Braham,; 1984; Brueggeman et al., 1987; Consiglieri et al., 1982; Cowen et al., 1987; Ferguson et al., 2015; Leatherwood, Bowles, and Reeves, 1983; Moore et al., 2007; NMML, 1992, 1993, 2001, 2003a, 2003b, 2012; Rugh, Shelden, and Schulman-Janiger, 2001, 2005a, 2005b; Shelden et al., 2013; Witteveen and Wynne, 2012, 2013.
100	S Shumagin- Gray Whale	A-2h	October-December	Gray Whale	Braham, 1984; Brueggeman et al., 1987; Consiglieri et al., 1982; Cowen et al., 1987; Ferguson et al., 2015; Leatherwood, Bowles, and Reeves, 1983; Moore et al., 2007; NMML, 1992, 1993,1998, 2001, 2003a; 2012; Rugh, Shelden, and Schulman-Janiger, 2001; Witteveen and Wynne, 2012, 2013;.

ERA ID	Name	Map	Vulnerable	Specific Resource	Reference
101	Cook Inlet 1- Harbor Porpoise	A-2a	June-September	Harbor Porpoise	Brueggeman et al., 1987; Consiglieri et al., 1982; Dahlheim et al., 2000. Hansen and Hubbard, 1999; Leatherwood, Bowles, and Reeves, 1983; Manly, 2006, 2007; NMML, 1991, 1998, 2012, 2013; Nemeth et al., 2007; Rone, 2014; Rugh et al., 2005a, 2005b; Shelden et al., 2013, 2014; Speckman, 2002; Speckman and Piatt, 2000.
102	Cook Inlet 2- Harbor Porpoise	A-2a	June-September	Harbor Porpoise	Same as ERA 101 plus NMML, 2001.
103	Cook Inlet 3- Harbor Porpoise	A-2c	June-September	Harbor Porpoise	Same as ERA 101.
104	Cook Inlet 4- Harbor Porpoise	A-2c	June-September	Harbor Porpoise	Same as ERA 101.
105	Cook Inlet 5- Harbor Porpoise	A-2b	June-September	Harbor Porpoise	Same as ERA 101.
106	SE Kodiak- Harbor Porpoise	A-2e	June-September	Harbor Porpoise	Brueggeman et al., 1987; Consiglieri et al., 1982; Dahlheim et al., 2000; Hansen and Hubbard, 1999; Manly, 2006, 2007; NMML, 1992, 1993, 1998, 2003a, 2012; Nemeth et al., 2007; Rugh et al., 2005a, 2005b; Shelden et al., 2013, 2014; Speckman, 2002; Speckman and Piatt, 2000; Witteveen and Wynne, 2012, 2013.
107	S Kodiak- Harbor Porpoise	A-2g	June-September	Harbor Porpoise	Same as ERA 106.
108	Shelikof- Killer Whale	A-2e	January-December	Killer Whale	Brueggeman et al., 1988; Consiglieri et al., 1982; Hansen and Hubbard, 1999; Leatherwood, Bowles, and Reeves, 1983; Matkin et al., 2012; NMML, 1992, 1993,1998, 2001, 2003a, 2003b, 2012; Rice and Wolman, 1981; Rugh et al., 2005a, 2005b; Shelden et al., 2013; Speckman, 2002; Witteveen and Wynne, 2012, 2013; Zerbini et al., 2007
109	E Kodiak- Killer Whale	A-2e	January-December	Killer Whale	Brueggeman et al., 1988; Consiglieri et al., 1982; Hansen and Hubbard, 1999; Leatherwood, Bowles, and Reeves, 1983; Matkin et al., 2012; NMML, 1992, 1993, 1998, 2003a, 2003b, 2009, 2012, 2013; Rice and Wolman, 1981; Rone, 2014; Rone et al., 2010; Rugh et al., 2005a, 2005b; Shelden et al., 2013; Speckman, 2002; Witteveen and Wynne, 2012, 2013; Zerbini et al., 2007.
110	SE Kenai- Dall’s Porpoise	A-2c	June-August	Dall’s Porpoise	Brueggeman et al., 1987, 1988; Consiglieri et al., 1982; Hansen and Hubbard, 1999; Leatherwood, Bowles, and Reeves, 1983; Manly, 2007; NMML, 1992, 1993, 1998, 2001, 2003a, 2003b, 2009, 2012, 2013; Rice and Wolman, 1981; Rone, 2014; Rone et al., 2010; Rugh et al., 2005a; Shelden et al., 2013; Speckman, 2002; Witteveen and Wynne, 2012, 2013.
BS ID					
2	Shumagin- Humpback Whale-	A-1	May-December	Humpback Whale	Brahem, 1984; Brueggeman et al., 1987, 1988; Consiglieri et al., 1982; Calambokidis et al., 2008; Dahlheim, 1994; Leatherwood, Bowles, and Reeves, 1983; Manly, 2007; NMML, 1992, 2001, 2003a, 2012; Rice and Wolman, 1981; Rugh et al., 2005a, 2005b; Shelden et al., 2013; Speckman, 2002; Waite, 2003; Waite et al., 1999; Witteveen and Wynne, 2013; Witteveen et al., 2007, 2008, 2011a, 2011b, 2014; Wynne, Foy, and Buck, 2011; Zerbini, Waite, and Wade, 2006.

Key: BS=Boundary Segment, CH=Critical Habitat; E = East; ERA = Environmental Resource Areas, MM=Marine Mammal; N = North; NE = Northeast; NPRW=North Pacific Right Whale; SE = Southeast.

Source: USDOI, BOEM, Alaska OCS Region (2015).

Table A.1-9. Environmental Resource Areas Used in the Analysis of Large or Very Large Oil Spill Effects on Marine Mammals (Seals and Sea Lions).

ID	Name	Map	Vulnerable	Specific Resource	References
11	Augustine	A-2a	January-December	Harbor seals	Boveng et al., 2003; 2011; Boveng, London, and Verhoef, 2012; Lowry et al., 2001; Montgomery, Ver Hoef, and Boveng, 2007; NOAA, 2014b, O'Corry-Crowe, Martien, and Taylor, 2003; Pitcher and Calkins, 1979; Rugh et al., 2005; Ver Hoef and Boveng, 2007.
12	South Cook HS 1a	A-2a	January-December	Harbor seals	Boveng et al., 2003; 2011; Boveng, London, and Verhoef, 2012; Lowry et al., 2001; Montgomery, Ver Hoef, and Boveng, 2007; NOAA, 2014b, O'Corry-Crowe, Martien, and Taylor, 2003; Pitcher and Calkins, 1979; Rugh et al., 2005; Ver Hoef and Boveng, 2007.
13	South Cook HS 1b	A-2a	January-December	Harbor seals	Boveng et al., 2003; 2011; Boveng, London, and Verhoef, 2012; Lowry et al., 2001; Montgomery, Ver Hoef, and Boveng, 2007; NOAA, 2014b, O'Corry-Crowe, Martien, and Taylor, 2003; Pitcher and Calkins, 1979; Rugh et al., 2005; Ver Hoef and Boveng, 2007.
14	South Cook HS 1c	A-2a	January-December	Harbor seals	Boveng et al., 2003; 2011; Boveng, London, and Verhoef, 2012; Lowry et al., 2001; Montgomery, Ver Hoef, and Boveng, 2007; NOAA, 2014b, O'Corry-Crowe, Martien, and Taylor, 2003; Pitcher and Calkins, 1979; Rugh et al., 2005; Ver Hoef and Boveng, 2007.
15	South Cook HS 1d	A-2a	January-December	Harbor seals	Boveng et al., 2003; 2011; Boveng, London, and Verhoef, 2012; Lowry et al., 2001; Montgomery, Ver Hoef, and Boveng, 2007; NOAA, 2014b, O'Corry-Crowe, Martien, and Taylor, 2003; Pitcher and Calkins, 1979; Rugh et al., 2005; Ver Hoef and Boveng, 2007.

ID	Name	Map	Vulnerable	Specific Resource	References
16	Inner Kachemak Bay	A-2b	January-December	Harbor seals	ADEC, 1997; ADFG, 1985a; 1988, 2014a; Boveng et al., 2003, 2011; Boveng, London, and Ver Hoef, 2012; Lowry et al., 2001; Montgomery, Ver Hoef, and Boveng. 2007; NOAA, 2014b; O'Corry-Crowe, Martien, and Taylor, 2003; Pitcher and Calkins, 1979; Rugh et al., 2005b.
17	Clam Gulch HS	A-2a	January-December	Harbor seals	ADEC, 1997; ADFG, 1985a; 1988, 2014a; Boveng et al., 2003, 2011; Boveng, London, and Ver Hoef, 2012; Lowry et al., 2001; Montgomery, Ver Hoef and Boveng. 2007; NOAA, 2014b; O'Corry-Crowe, Martien, and Taylor, 2003; Pitcher and Calkins, 1979; Rugh et al., 2005.
18	Tuxedni HS	A-2a	March-December	Harbor seals	ADEC, 1997; ADFG, 1985a; 1988, 2014a; Boveng et al., 2003, 2011; Boveng, London, and Ver Hoef, 2012; Lowry et al., 2001; Montgomery, Ver Hoef and Boveng. 2007; NOAA, 2014b; O'Corry-Crowe, Martien, and Taylor, 2003; Pitcher and Calkins, 1979; Rugh et al., 2005.
19	Kalgin Island HS	A-2a	March-December	Harbor seals	ADEC, 1997; ADFG, 1985a; 1988, 2014a; Boveng et al., 2003, 2011; Boveng, London, and Ver Hoef, 2012; Lowry et al., 2001; Montgomery, Ver Hoef and Boveng. 2007; NOAA, 2014b; O'Corry-Crowe, Martien, and Taylor, 2003; Pitcher and Calkins, 1979; Rugh et al., 2005.
20	Redoubt Bay HS	A-2b	March-December	Harbor seals	ADEC, 1997; ADFG, 1985a; 1988, 2014a; Boveng et al., 2003, 2011; Boveng, London, and Ver Hoef, 2012; Lowry et al., 2001; Montgomery, Ver Hoef and Boveng. 2007; NOAA, 2014b; O'Corry-Crowe, Martien, and Taylor, 2003; Pitcher and Calkins, 1979; Rugh et al., 2005.
21	Trading Bay HS	A-2b	March-December	Harbor seals	ADEC, 1997; ADFG, 1985a; 1988, 2014a; Boveng et al., 2003, 2011; Boveng, London and Ver Hoef, 2012; Lowry et al., 2001; Montgomery, Ver Hoef and Boveng. 2007; NOAA, 2014b; O'Corry-Crowe, Martien, and Taylor, 2003; Pitcher and Calkins, 1979; Rugh et al., 2005.
22	Susitna Flats HS	A-2a	March-December	Harbor seals	ADEC, 1997; ADFG, 1985a; 1988, 2014a; Boveng et al., 2003, 2011; Boveng, London and Ver Hoef, 2012; Lowry et al., 2001; Montgomery, Ver Hoef and Boveng. 2007; NOAA, 2014b; O'Corry-Crowe, Martien, and Taylor, 2003; Pitcher and Calkins, 1979; Rugh et al., 2005.
23	Barren Is. Pinniped	A-2b	January-December	Harbor seals, Steller sea lions	Boveng et al., 2003; 58 *FR* 45269, August 27, 1993; Lowry et al., 2001; NOAA, 2014b.
24	Shelikof MM 2	A-2d	January-December	Harbor seals, Steller sea lions	ADEC, 1997; ADFG, 1985b; ADFG, 1997; ADFG, 2014; Boveng et al., 2003; 58 *FR* 45269, August 27, 1993; Lowry et al., 2001; NOAA, 2014b.
25	Shelikof MM 3	A-2d	January-December	Harbor seals, Steller sea lions	ADEC, 1997; ADFG, 1985b; ADFG, 1997; ADFG, 2014; Boveng et al., 2003; 58 *FR* 45269, August 27, 1993; Lowry et al., 2001; NOAA, 2014b.
26	Shelikof MM 4	A-2d	January-December	Harbor seals, Steller sea lions	ADEC, 1997; ADFG, 1985b; ADFG, 1997; ADFG, 2014; Boveng et al., 2003; 58 *FR* 45269, August 27, 1993; Lowry et al., 2001; NOAA, 2014b.
27	Shelikof MM 5	A-2d	January-December	Harbor seals, Steller sea lions	ADEC, 1997; ADFG, 1985b; ADFG, 1997; ADFG, 2014; Boveng et al., 2003; 58 *FR* 45269, August 27, 1993; Lowry et al., 2001; NOAA, 2014b.
28	Shelikof MM 6	A-2d	January-December	Harbor seals, Steller sea lions	ADEC, 1997; ADFG, 1985b; ADFG, 1997; ADFG, 2014; Boveng et al., 2003; 58 *FR* 45269, August 27, 1993; Lowry et al., 2001; NOAA, 2014b.
29	Shelikof MM 7	A-2d	January-December	Harbor seals, Steller sea lions	ADEC, 1997; ADFG, 1985b; ADFG, 1997; ADFG, 2014; Boveng et al., 2003; 58 *FR* 45269, August 27, 1993; Lowry et al., 2001; NOAA, 2014b.
30	Shelikof MM 8	A-2d	January-December	Harbor seals, Steller sea lions	ADEC, 1997; ADFG, 1985b; ADFG, 1997; ADFG, 2014; Boveng et al., 2003; 58 *FR* 45269, August 27, 1993; Lowry et al., 2001; NOAA, 2014b.
31	Kodiak Pinniped 1	A-2e	January-December	Harbor seals, Steller sea lions	ADEC, 1997; ADFG, 1985b; ADFG, 1997; ADFG, 2014; Boveng et al., 2003; 58 *FR* 45269, August 27, 1993; Lowry et al., 2001; NOAA, 2014b.
32	Kodiak Pinniped 2	A-2e	January-December	Harbor seals, Steller sea lions	ADEC, 1997; ADFG, 1985b; ADFG, 1997; ADFG, 2014; Boveng et al., 2003; 58 *FR* 45269, August 27, 1993; Lowry et al., 2001; NOAA, 2014b.
33	Kodiak Pinniped 3	A-2e	January-December	Harbor seals, Steller sea lions	ADEC, 1997; ADFG, 1985b; ADFG, 1997; ADFG, 2014; Boveng et al., 2003; 58 *FR* 45269, August 27, 1993; Lowry et al., 2001; NOAA, 2014b.
34	Kodiak Pinniped 4	A-2e	January-December	Harbor seals, Steller sea lions	ADEC, 1997; ADFG, 1985b; 1997; 2014a; Boveng et al., 2003; 58 *FR* 45269, August 27, 1993.
35	Kodiak Pinniped 5	A-2e	January-December	Harbor seals, Steller sea lions	ADEC, 1997; ADFG, 1985b; 1997; 2014a; Boveng et al., 2003; 58 *FR* 45269, August 27, 1993; Lowry et al., 2001; NOAA, 2014b.
36	Kodiak Pinniped 6	A-2e	January-December	Harbor seals, Steller sea lions	ADEC, 1997; ADFG, 1985b; 1997; 2014a; Boveng et al., 2003; 58 *FR* 45269, August 27, 1993; Lowry et al., 2001; NOAA, 2014b.
37	Port Chatham Pinniped	A-2b	January-December	Harbor seals, Steller sea lions	Boveng et al., 2003; 58 *FR* 45269, August 27, 1993; Lowry et al., 2001; NOAA, 2014b.
38	Port Dick Pinniped	A-2b	January-December	Harbor seals, Steller sea lions	Boveng et al., 2003; 58 *FR* 45269, August 27, 1993; Lowry et al., 2001; NOAA, 2014b.
39	Two-Arm Bay Pinniped	A-2b	January-December	Harbor seals, Steller sea lions	Boveng et al., 2003; 58 *FR* 45269, August 27, 1993; Lowry et al., 2001; NOAA, 2014b.
40	Nuka Bay Pinniped	A-2c	January-December	Harbor seals, Steller sea lions	Boveng et al., 2003; 58 *FR* 45269, August 27, 1993; Lowry et al., 2001; NOAA, 2014b.

ID	Name	Map	Vulnerable	Specific Resource	References
41	Chiswell Pinniped	A-2c	January-December	Harbor seals, Steller sea lions	Boveng et al., 2003; 58 *FR* 45269, August 27, 1993; Lowry et al., 2001; NOAA, 2014b.
42	Cape Puget Pinniped	A-2c	January-December	Harbor seals, Steller sea lions	Boveng et al., 2003; 58 *FR* 45269, August 27, 1993; Lowry et al., 2001; NOAA, 2014b.
43	AK Peninsula Pinniped 1	A-2h	January-December	Harbor seals, Steller sea lions	Boveng et al., 2003; 58 *FR* 45269, August 27, 1993; Lowry et al., 2001; NOAA, 2014.
44	AK Peninsula Pinniped 2	A-2h	January-December	Harbor seals, Steller sea lions	Boveng et al., 2003; 58 *FR* 45269, August 27, 1993; Lowry et al., 2001; NOAA, 2014.

Key: AK= Alaska; HS = Harbor Seal; Is. = Island, MM=Marine Mammal;
Source: USDOI, BOEM, Alaska OCS Region (2015).

Table A.1-10. Environmental Resource Areas Used in the Analysis of Large or Very Large Oil Spill Effects on Marine Mammals (Sea otters).

ID	Name	Map	Vulnerable	Specific Resource	Reference
ERA ID					
45	Clam Gulch	A-2a	January-December	Sea otters	Bodkin, Monson, and Esslinger, 2003; Doroff and Badajos, 2010; Gill, Doroff, and Burn, 2009; USFWS, 2014a.
16	Inner Kachemak Bay	A-2b	January-December	Sea otters	Doroff and Badajos, 2010; Gill, Doroff, and Burn, 2009.
46	Outer Kachemak Bay	A-2b	January-December	Sea otters	Bodkin, Monson, and Esslinger, 2003; Doroff and Badajos, 2010; Gill, Doroff, and Burn, 2009; USFWS, 2014a.
145	Outer Kachemak Bay/IBA	A-2a	January-December	Sea otters	Bodkin, Monson, and Esslinger, 2003; Doroff and Badajos, 2010; Gill, Doroff, and Burn, 2009; USFWS, 2014a.
47	SW Cook Inlet	A-2b	January-December	Sea otters	Bodkin, Monson, and Esslinger, 2003; 74 *FR* 51988, October 8, 2009; USFWS, 2013.
48	Kamishak Bay	A-2b	January-December	Sea otters	Bodkin, Monson, and Esslinger, 2003; 74 *FR* 51988, October 8, 2009; USFWS, 2013.
49	Katmai NP	A-2e	January-December	Sea otters	Coletti et al., 2014; 74 *FR* 51988, October 8, 2009; USFWS, 2013.
50	Becharof NWR	A-2e	January-December	Sea otters	Coletti et al., 2014; 74 *FR* 51988, October 8, 2009; USFWS, 2013, 2015c.
51	Alaska Peninsula NWR North	A-2f	January-December	Sea otters	74 *FR* 51988, October 8, 2009; USFWS, 2013.
52	Aniakchak NM&P	A-2h	January-December	Sea otters	74 *FR* 51988, October 8, 2009; USFWS, 2013.
53	Alaska Peninsula NWR South	A-2h	January-December	Sea otters	74 *FR* 51988, October 8, 2009; USFWS, 2013.
54	Sutwick Island	A-2h	January-December	Sea otters	74 *FR* 51988, October 8, 2009; USFWS, 2013.
55	Semidi Islands	A-2h	January-December	Sea otters	74 *FR* 51988, October 8, 2009; USFWS, 2013.
56	Chirikof Island	A-2h	January-December	Sea otters	74 *FR* 51988, October 8, 2009; USFWS, 2013.
57	Trinity Islands	A-2h	January-December	Sea otters	74 *FR* 51988, October 8, 2009; USFWS, 2013, 2014b.
58	Kodiak NWR-east	A-2e	January-December	Sea otters	74 *FR* 51988, October 8, 2009; USFWS, 2013, 2014b.
59	Kodiak NWR-south	A-2e	January-December	Sea otters	74 *FR* 51988, October 8, 2009; USFWS, 2013, 2014b.
60	Kodiak NWR-west	A-2e	January-December	Sea otters	74 *FR* 51988, October 8, 2009; USFWS, 2013, 2014b.
61	NE Kodiak	A-2e	January-December	Sea otters	74 *FR* 51988, October 8, 2009; USFWS, 2013, 2014b.
62	Chiniak Bay	A-2e	January-December	Sea otters	74 *FR* 51988, October 8, 2009; USFWS, 2013, 2014b.
63	Ugak Bay	A-2e	January-December	Sea otters	74 *FR* 51988, October 8, 2009; USFWS, 2013, 2014b.
64	Afognak-west	A-2e	January-December	Sea otters	74 *FR* 51988, October 8, 2009; USFWS, 2013, 2014b.
65	Afognak-north	A-2e	January-December	Sea otters	74 *FR* 51988, October 8, 2009; USFWS, 2013, 2014b.
66	Afognak-east	A-2e	January-December	Sea otters	74 *FR* 51988, October 8, 2009; USFWS, 2013, 2014b.
67	Shuyak	A-2e	January-December	Sea otters	74 *FR* 51988, October 8, 2009; USFWS, 2013, 2014b.
68	Kenai Fjords-west	A-2b	January-December	Sea otters	Bodkin, Monson, and Esslinger, 2003.
LS ID					
7	Chignik Bay	A-3a	January-December	Sea otters	74 *FR* 51988, October 8, 2009; USFWS, 2013.
15	Wide Bay	A.3a	January-December	Sea otters	74 *FR* 51988, October 8, 2009; USFWS, 2013.
35	Tuxedni Bay	A-3c	January-December	Sea otters	Bodkin, Monson, and Esslinger, 2003; 74 FR 51988, October 8, 2009; USFWS, 2013.
65	West arm Port Dick	A-3a	January-December	Sea otters	Bodkin, Monson, and Esslinger, 2003; Coletti, Bodkin, and Esslinger, 2011.
84	Raspberry Strait	A-3b	January-December	Sea otters	74 *FR* 51988, October 8, 2009; USFWS, 2013, 2014b.
87	Uyak Bay	A-3b	January-December	Sea otters	74 *FR* 51988, October 8, 2009; USFWS, 2013, 2014b.
86	Uginak Bay/Passage	A.3b	January-December	Sea otters	74 *FR* 51988, October 8, 2009; USFWS, 2013, 2014b.
92	Alitak Bay	A-3b	January-December	Sea otters	74 *FR* 51988, October 8, 2009; USFWS, 2013, 2014b.
GLS ID					

ID	Name	Map	Vulnerable	Specific Resource	Reference
119	Kuiukta Bay	A-4b	January-December	Sea otters	74 *FR* 51988, October 8, 2009; USFWS, 2013, 2014b.
124	Kukak Bay	A-4b	January-December	Sea otters	74 *FR* 51988, October 8, 2009; USFWS, 2013, 2014b.
141	Seldovia side Kachemak Bay	A-4b	January-December	Sea otters	Gill, Doroff, and Burn, 2009.
144	Kenai Fjords National Park	A-4b	January-December	Sea otters	Bodkin, Monson, and Esslinger, 2003; Coletti, Bodkin, and Esslinger, 2011.
146	Resurrection Bay	A-4b	January-December	Sea otters	Bodkin, Monson, and Esslinger, 2003; Coletti, Bodkin, and Esslinger, 2011.
149	Elrington-Bambridge-LaTouche Islands	A-4b	January-December	Sea otters	Bodkin et al., 2003.
150	E Montague Island	A.4b	January-December	Sea otters	Bodkin et al., 2003.
152	Barren Islands	A-4a	January-December	Sea otters	USFWS, 2013.
159	Kupreanof Strait	A-4a	January-December	Sea otters	74 *FR* 51988, October 8, 2009; USFWS, 2013, 2014b.

Key: E = East; IBA= Important Bird Area; NE= Northeast; NM&P= National Monument and Preserve; NP= National Park; NWR = National Wildlife Refuge.
Source: USDOI, BOEM, Alaska OCS Region (2015).

Table A.1-11. Environmental Resource Areas Used in the Analysis of Large or Very Large Oil Spill Effects on Subsistence Resources.

ID	Name	Map	Vulnerable	Specific Resource	Reference
ERA ID					
1	SUA: Tyonek; Beluga	A-2a	March-October	Beluga	SRB&A and Huntington Consulting, 2011 (pp.37).
2	SUA: Tyonek North	A-2a	March-October	Salmon (5 Species) Tomcod, Herring, Eulachon, Harbor seal, Beluga, Clams, Cockle	Fall, Foster, and Stanek, 1984; Schroeder et al., 1987.
3	SUA: Tyonek South	A-2a	March-October	Salmon (5 Species) Tomcod, Herring, Eulachon, Harbor seal, Beluga, Clams, Cockle	Fall, Foster, and Stanek, 1984; Schroeder et al., 1987.
4	SUA: Seldovia, Port Graham, Nanwalek	A-2a	January-December	Salmon (5 Species), Halibut, Trout, Cod, Flounder, Rockfish, Sculpin, Herring, Clams, Crab, Bidarkies, Octopus, Waterfowl, Seals, Sea Lions, Eggs, Seaweed, Kelp	KPB, 1992 (Fig. B, pp. 4); Schroeder et al., 1987; Seldovia Village Tribe, 2013; Stanek, 1985.
5	SUA: Port Lions	A-2d	January-December	Salmon (5 Species), Halibut, Seals, Clams, Crab	Schroeder et al., 1987; Wolfe et al., 2012.
6	SUA: Ouzinke	A-2d	January-December	Salmon (4 Species), Halibut, Steelhead, Seals, Sea Lion, Clams, Crab	Schroeder et al., 1987; Wolfe et al., 2012.
7	SUA: Larsen Bay	A-2d	January-December	Salmon (5 Species), Halibut, Steelhead, Seals, Sea Lions, Clams, Crab	Schroeder et al., 1987; Wolfe et al., 2012.
8	SUA: Karluk	A-2d	January-December	Salmon (5 Species),Halibut, Seals, Sea Lions, Clams, Crab	Schroeder et al., 1987; Wolfe et al., 2012.
9	SUA: Akhiok	A-2d	January-December	Salmon (5 Species), Halibut, Steehead, Seals, Sea Lions, Clams, Crab	Schroeder et al., 1987; Wolfe et al., 2012.
10	SUA: Old Harbor	A-2d	January-December	Salmon (5 Species), Halibut, Steehead, Seals, Sea Lions, Clams, Crab	Schroeder et al., 1987; Wolfe et al., 2012.
GLS ID					
115	SUA: Chignik Lake, Ivanof Bay, Perryville	A-4a	January-December	Salmon, Halibut, Herring, Pacific Cod, Shellfish, Caribou, Deer, Moose, Brown Bear, Seals, Sea Lions, and Sea Otters.	Morris, 1987.
116	SUA: Chignik, Chignik Lagoon	A-4a	January-December	Salmon, Halibut, Herring, Pacific Cod, Shellfish, Caribou, Deer, Moose, Brown Bear, Seals, Sea Lions, and Sea Otters.	Morris, 1987.

Key: SUA= Subsistence Use Area
Source: USDOI, BOEM, Alaska OCS Region (2015).

Table A.1-12. Land Segments Used in the Analysis of Large or Very Large Oil Spill Effects on Anadromous Fish.

LS ID	Name	Map	Vulnerable	Specific Resource	Reference
1	Unnamed stream(s)	A-3a	May-November	CHs,Pp,Ss,Ps,CHp,SHp,Sp,COs,Psr	Johnson and Coleman, 2014.
2	Unnamed stream(s), Kupreanof Creek, Ivanof River, Wolverine Creek, Smokey Hollow Creek, Osterback Creek, Big River, Bluff Point Creek	A-3a	May-November	CHp,Pp,CHs,Ps,COp,COs,Sp,CHsp	Johnson and Coleman, 2014.
3	Unnamed stream(s), Kametolook River, Candlefish Slough, Artemie's Creek, Ivanof River, Humpback Creek, Red Bluff Creek, Three Star River, Cross Creek Slough, Spring Creek	A-3a	May-November	CHp,Pp,COp,CHs,Ps,COr,Sp,COs, Psr	Johnson and Coleman, 2014.
4	Unnamed stream(s), Ivan River, Fishrack Creek, Red Bluff Creek	A-3a	May-November	CHp,COsr,Ps,Pp,SHp,CHs,COp,Sp	Johnson and Coleman, 2014.
5	Windy Creek, Foot Creek, Unnamed stream(s)	A-3a	May-November	CHs,Ps,Pp	Johnson and Coleman, 2014.
6	Unnamed stream(s), Spoon Creek, Portage Creek, Metrofania Creek, Castle Creek, Chignik River	A-3a	May-November	COsr,Psr,CHs,Ps,Pp,DVr,CHp	Johnson and Coleman, 2014.
7	Chignik River, Unnamed stream(s), Through Creek, Frank Creek, Alfred Creek, Metrofania Creek, Mallard Duck Creek, Marshinlak Creek, Packers Creek, Lake Bay Creek, Owen Creek	A-3a	May-November	CHp,COp,Ks,Ps,Ss,DVp,SHp,CHs,Pp ,Sp,DVsr,COs,Psr,DVr	Johnson and Coleman, 2014.
8	McKinsey Creek, Thompson Creek, Neketa Creek, Unnamed stream(s), Dry Creek, Hook Creek, Bear Creek	A-3a	May-November	Ps,CHs,Pp,COs,COsr,COp	Johnson and Coleman, 2014.

LS ID	Name	Map	Vulnerable	Specific Resource	Reference
9	Bear Creek, Packers Creek, Unnamed stream(s), Rudy Creek, Blue Violet Creek, Kumliun Creek, New Creek, Meshik L	A-3a	May-November	CHs,Ps,Pp,Ks,Ss,CHp,COr	Johnson and Coleman, 2014.
10	Unnamed stream(s), West Creek, North Fork Aniakchak River, Aniakchak River, New Creek, Black Creek, Wolverine Creek, Mystery Creek, Albert Johnson Creek	A-3a	May-November	Pp,CHp,Ps,CHs,Ss,COp,Sp	Johnson and Coleman, 2014.
11	Northeast Creek, Unnamed stream(s), Yantarni Creek, Misery Creek, Home Creek, Mountain Creek, West Creek, Main Creek	A-3a	May-November	CHs,COp,Ps,CHp,Pp,Ssr,Sp,Ss	Johnson and Coleman, 2014.
12	Unnamed stream(s), Camp Creek, Nakalilok Bay Creek	A-3a	May-November	CHp,COp,Pp,COpr,Kp,Ss,CHs,Ps,Sp	Johnson and Coleman, 2014.
13	Unnamed stream(s), Agripina River	A-3a	May-November	Ps,CHs,Pp,Ss,CHp,Sp,COp	Johnson and Coleman, 2014.
14	Glacier Creek, Unnamed stream(s), Kilokak Creek, Agripina River, Circ Creek, Alai Creek, Imuya Creek, Kialaguik Creek	A-3a	May-November	CHp,Pp,Ssr,CHs,Ps,Sp,COp,CHsr	Johnson and Coleman, 2014.
15	Big Creek, Unnamed stream(s), Tiny Creek, Pass Creek, Des Moines Creek, Black Creek, Short Creek, Beach Creek	A-3a	May-November	CHs,COp,Ps,Pp,Ss,CHsr,Psr	Johnson and Coleman, 2014.
16	Unnamed stream(s), Jute Creek, Salmon Creek, Bear Creek, Porcupine Creek, Rex Creek, South Fork Rex Creek, North Fork Rex Creek, Sulphur Creek, Little Kanatak Creek, Kanatak Creek, Otter Creek	A-3a	May-November	Ps,DVp,CHs,Ss,Pp,CHp,COp,Sp,COs	Johnson and Coleman, 2014.
17	Unnamed stream(s), Teresa Creek, Dry Creek, Trail Creek, Katie Creek, Becharof Creek, Oil Creek, Helen Creek, Portage Creek	A-3b	May-November	CHs,COp,Ps,DVp,DVs,CHsr,Ss,CHp,Pp	Johnson and Coleman, 2014.
18	North Creek, Moose Creek, Portage Creek, Helen Creek, Little Alinchak Creek, Big Alinchak Creek, Unnamed stream(s), West Creek	A-3b	May-November	CHs,COsr,Ps,DVp,CHp,Pp,Sp	Johnson and Coleman, 2014.
19	Big Kashvik Creek, Unnamed stream(s), Katmai River, Soluka Creek, Alagogshak Creek	A-3b	May-November	CHs,Ps,DVp,CHp,Pp	Johnson and Coleman, 2014.
20	Unnamed stream(s), Geographic Creek, Dakavak Creek	A-3b	May-November	Ps,Pp,CHsr,CHs,COsr	Johnson and Coleman, 2014.
21	Unnamed stream(s), Kinak Creek, Halferty Creek, Missak Creek, Low Pass Creek	A-3b	May-November	CHp,COp,Pp,Ss,COr,Ssr,CHs,Ps,CHs .Ps,COsr	Johnson and Coleman, 2014.
22	Serpent Creek, Hook Creek, Unnamed stream(s), Ninagiak River, Hallo Creek	A-3b	May-November	CHp,COsr,Pp,CHs,Ps,Psr	Johnson and Coleman, 2014.
23	Big River, Unnamed stream(s), Swikshak River, Chiniak Lagoon, Cape Chiniak Creek	A-3b	May-November	CHs,COsr,Ps,COp,Ss,DVp,CHp,Pp,COr,Sr,COs,Sp,Psr,CHsr	Johnson and Coleman, 2014.
24	Unnamed stream(s), Swikshak River, Bluff Creek, Long Slough Creek	A-3b	May-November	Ps,DVp,Pp,CHs,Ss,COr,Sr,COp,CHp,Psr,Sp	Johnson and Coleman, 2014.
25	Douglas Creek, Unnamed stream(s), Clear Creek	A-3b	May-November	CHsr,Ps,CHs,COp,COsr	Johnson and Coleman, 2014.
26	Unnamed stream(s), Douglas River	A-3c	May-November	Ps,CHs,CHp,COp,Pp,Sp,COr,COs,Ss,ACp	Johnson and Coleman, 2014.
27	Unnamed stream(s), McNeil River, Mikfik Creek, Little Kamishak River, Strike Creek, Kamishak River, Paint River	A-3c	May-November	Ss,ACp,CHs,Ps,COs,COr,Ks,Pp,COp,Kp,CHp,Sp	Johnson and Coleman, 2014.
28	Chenik Lake, Unnamed stream(s), Amakdedori Creek	A-3c	May-November	Ss,ACp,CHp,COp,Pp,SHp,Sp,COs,CHs,Ps,COr	Johnson and Coleman, 2014.
30	Unnamed stream(s), Sunday Creek	A-3c	May-November	CHs,COs,Ps,ACp,Sp,CHp,Pp,Ss	Johnson and Coleman, 2014.
31	Unnamed stream(s), Y-Valley Creek	A-3c	May-November	Ss,Sp,Ps,Pp,ACp,CHs,CHp,COs,COr,COp,Kp,Kr	Johnson and Coleman, 2014.
32	Bowser Creek, Brown Creek, Chinitna River, Unnamed stream(s), Iniskin River, Right Arm Creek, Portage Creek, Fitz Creek, Trail Creek, Wrong Branch Trail Creek, Clearwater Creek, Roscoe Creek, Marsh Creek	A-3c	May-November	COp,CHs,Ps,CHp,Sp,ACp,Pp,COs	Johnson and Coleman, 2014.
33	West Glacier Creek, Fitz Creek, Silver Salmon Creek, East Glacier Creek	A-3c	May-November	CHp,Sp,COs,ACp,CHs,COp	Johnson and Coleman, 2014.
34	Silver Salmon Lakes, Johnson River, Unnamed stream(s), Shelter Creek	A-3c	May-November	CHp,COp,DVp,CHs,COs,Pp,Ps,Sp,COr	Johnson and Coleman, 2014.
35	Crescent River, Unnamed stream(s), Hungryman Creek, Bear Creek	A-3c	May-November	CHp,COp,Kp,Pp,Sp,DVp,COr	Johnson and Coleman, 2014.
36	Wadell Lake, Bear Lake, Polly Creek, Harriet Creek, Unnamed stream(s), Redoubt Creek, Little Polly Creek, Redoubt Creek trib, Crescent River	A-3c	May-November	Ss,DVp,CHs,COs,CHp,COp,Ps,Sp,COr,Kr,Kp,COsr,Pp	Johnson and Coleman, 2014.
37	Unnamed stream(s), Rust Slough, Cannery Creek, Drift River, Little Jack Slough	A-3c	May-November	Ss,Sp,COp,DVp,COpr,COr,Pp	Johnson and Coleman, 2014.
38	Packers Creek Lake, Unnamed stream(s), Packers Creek	A-3c	May-November	COp,Ss,DVp,COs,Sp	Johnson and Coleman, 2014.
39	Unnamed stream(s), Montana Bill Creek, Big River, Johnson Slough, Seal River, Bachatna Creek	A-3c	May-November	COs,COp,DVp,COr,Kp,Pp,Sp,Sr	Johnson and Coleman, 2014.
40	Kustatan River, Unnamed stream(s)	A-3c	May-November	COp,Kp,Pp,Sp,DVp	Johnson and Coleman, 2014.

LS ID	Name	Map	Vulnerable	Specific Resource	Reference
41	Nikolai Creek, Stedatna Creek, Middle River, Chakachatna River, Chuitkilnachna Creek, McArthur River, Unnamed stream(s)	A-3c	May-November	Ps,DVr,COr,COp,Sp,CHs,COpr,Kp,Pp,Spr,DVpr,CHp,Kr	Johnson and Coleman, 2014.
42	Tyonek Creek, Old Tyonek Creek, Unnamed stream(s), Nikolai Creek, Indian Creek, Chuitna River, Chuitna Braid	A-3c	May-November	Ps,COpr,Kp,OUp,COp,COr,CHr,Pr,Kpr,Pp,DVr,CHp,Sp,DVp,ALp,PCp	Johnson and Coleman, 2014.
43	Tukallah Lake, Threemile Creek, Unnamed stream(s), Chuitna River	A-3c	May-November	COsr,Kpr,Pp,Ss,CHp,Kr,COs,Ps,Sp,COr,CHr,Pr,CHs,COpr,Kp,Spr,ALp,DVp,PCp	Johnson and Coleman, 2014.
44	Ivan River, Beluga River, Pretty Creek, Theodore River, Lewis River, Unnamed stream(s)	A-3c	May-November	COp,Ks,Pp,Ksr,Kr,COpr,Kpr,Spr,COr,Ps,Sr,CHp	Johnson and Coleman, 2014.
45	Unnamed stream(s), Maguire Creek, Little Susitna River, Susitna River	A-3c	May-November	COp,Kr,COr,CHp,Kp,Pp,Sp,COs,ALp,DVp,HWp,OUs	Johnson and Coleman, 2014.
46	Fish Creek, Unnamed stream(s)	A-3c	May-November	COr,COp	Johnson and Coleman, 2014.
49	Seven Egg Creek, Miller Creek	A-3c	May-November	COs,COr	Johnson and Coleman, 2014.
50	Otter Creek, Seven Egg Creek, Unnamed stream(s)	A-3c	May-November	COs,DVp,COr	Johnson and Coleman, 2014.
51	Bishop Lake, Unnamed stream(s), Parsons Lake, Daniels Lake, Duck Lake, Bishop Creek, Stormy Lake Outlet Creek, Swanson River, Stormy Lake	A-3c	May-November	COs,Ss,DVp,COp,Sp,COsr,COr,Ps,Pp	Johnson and Coleman, 2014.
52	Unnamed stream(s)	A-3c	May-November	Kr,COr,Sr	Johnson and Coleman, 2014.
53	Unnamed stream(s), Kasilof River, Kenai River	A-3c	May-November	Sr,COr,Kr,COp,Ks,Ps,Sm,DVp,PCp,SHp,CHp,Sp,LPp,OUp,Wp	Johnson and Coleman, 2014.
54	Coal Creek, Crooked Creek, Unnamed stream(s), Kasilof River	A-3c	May-November	Ps,COs,DVp,Ks,Pp,Ss,PCp,SHp,COr,Kr	Johnson and Coleman, 2014.
55	Ninilchik River, Deep Creek, Unnamed stream(s), Clam Creek	A-3c	May-November	Ks,Pp,Kp,COs,DVp,SHp,Ps,COsr,Ksr,DVpr,COr,Kr,Kpr,DVr	Johnson and Coleman, 2014.
56	Stariski Creek, Chakok River, Unnamed stream(s), Clam Creek, Deep Creek	A-3c	May-November	Ps,COs,Ks,SHp,COr,DVp,Kp,Kr,COsr,DVr,COp	Johnson and Coleman, 2014.
57	Anchor River, Unnamed stream(s), Bridge Creek, Chakok River, Ruby Creek, Two Moose Creek, North Fork Anchor River, Twitter Creek, Telephone Creek	A-3c	May-November	Ps,CHp,COsr,Ksr,Pp,Sp,DVp,SHp,SHs,COr,Kr,DVr,SHr,COp,COs,Ks,DVpr	Johnson and Coleman, 2014.
58	Bridge Creek, Fritz Creek, Beluga Sough	A-3c	May-November	DVp,Ps,COr	Johnson and Coleman, 2014.
59	Humpy Creek, Beaver Creek, Unnamed stream(s)	A-3c	May-November	COr,CHs,COsr,Ksr,Ps,COp,DVpr	Johnson and Coleman, 2014.
60	Unnamed stream(s), Stonehocker Creek, Silver Creek, Estuary Creek, Wosnesenski River	A-3c	May-November	COp,COs,Pp,CHs,Ps,Ss,COr,Ssr,CHp,Sp	Johnson and Coleman, 2014.
61	Jakolof Creek, Unnamed stream(s), Barabara Creek, Seldovia River, Seldovia Slough	A-3c	May-November	COp,Sp,CHs,Ps,Pp,CHp,COs,Ss,DVs	Johnson and Coleman, 2014.
62	Unnamed stream(s), English Bay River	A-3c	May-November	COs,Pp,Ss,DVsr,CHs,Ps,CHp,DVp,COp,DVs,COr,Sp	Johnson and Coleman, 2014.
63	Unnamed stream(s), Perl Island Stream, English Bay River	A-3d	May-November	Pp,COp,Sp,COr,Ss,DVr,DVp,Ps,CHs,COs,CHp,Sr,DVsr	Johnson and Coleman, 2014.
64	Unnamed stream(s), Rocky River	A-3d	May-November	COp,Ss,CHs,COs,Ps,DVs,COr,DVsr,Sp,DVp,COsr,DVr	Johnson and Coleman, 2014.
65	Port Dick Creek, Unnamed stream(s), Island Creek, Slide Creek, Port Dick Creek	A-3d	May-November	CHs,COs,Ps,Sp,CHp,Pp	Johnson and Coleman, 2014.
66	Unnamed stream(s)	A-3d	May-November	CHs,Ps,CHp	Johnson and Coleman, 2014.
67	Unnamed stream(s), Ferrum Creek, Nuka Delta, Shelter Cove Creek	A-3d	May-November	Ps,CHs,COp,Pp,Sp	Johnson and Coleman, 2014.
68	Unnamed stream(s), Nuka River, Babcock Creek	A-3d	May-November	Ps,Pp,CHs,CHp,COp,SMp	Johnson and Coleman, 2014.
69	Delight Lake, Unnamed stream(s)	A-3d	May-November	COp,Kp,Ps,Ss,Pp,CHs,COs,Sp,Ks,COr	Johnson and Coleman, 2014.
70	Unnamed stream(s), Crescent Beach Pond, Boulder Creek	A-3d	May-November	Pp,Ps,CHs,COs,CHp,COp,Sp	Johnson and Coleman, 2014.
71	Unnamed stream(s)	A-3d	May-November	CHp,COp,Pp,Sp,Ss,Ps	Johnson and Coleman, 2014.
72	Unnamed stream(s), Likes Creek	A-3d	May-November	CHp,Pp,CHs,Ps	Johnson and Coleman, 2014.
73	Little Johnstone Lake, Unnamed stream(s), Puget Lake, Puget River	A-3d	May-November	CHsr,COsr,Pp,Ssr,DVsr,Ps,Ss	Johnson and Coleman, 2014.
74	Unnamed stream(s)	A-3d	May-November	Pp,Ps	Johnson and Coleman, 2014.

LS ID	Name	Map	Vulnerable	Specific Resource	Reference
75	Unnamed stream(s), San Juan Creek, Trap Creek	A-3d	May-November	Pp,COr,Ssr	Johnson and Coleman, 2014.
76	Unnamed stream(s), Nellie Martin River, Braided Creek, Patton Creek, Jeanie Creek, Slide Creek, Deception Creek, San Juan Creek, Stump Lake, Point Creek, Trap Creek, McLeod Creek, Clam Beach, Strike Creek, Patton River, Old Patton River Channel, Hanning Creek	A-3d	May-November	COr,Pp,COsr,Sr,CHp,Ps,CTp,DVp,Sp,COs,COpr,Psp,DVr,COp,Ssr,CHsp,CHs	Johnson and Coleman, 2014.
77	Unnamed stream(s), Montague Creek, Montague Island #4 (Clearcut), Beach River, Montague Island #5 (Glacial), Montague Island #2, Montague Island #3, Montague Island #6, Behymer Creek, Quadra Creek	A-3d	May-November	COr,Ps,Pp,DVp,CHp,CHs,COp	Johnson and Coleman, 2014.
78	Unnamed stream(s), Kelez Creek, Cabin Creek, Chalmers River, Wilby Creek, Wild Creek, Schuman Creek, Dry Creek, Stockdale Harbor, Stockdale Creek, Gilmour Creek, Carr Creek, McKernan Creek, Rosswog Creek, Pautzke Creek, Udall Creek, Shad Creek, Swamp Creek, Russell Creek	A-3d	May-November	Pp,CHp,COr,DVp,Ps,COs,CHsp,Psp, Sp,DVr,CHs	Johnson and Coleman, 2014.
81	Unnamed stream(s), Shangin Narrows, Carry Bear Creek, Danny's Slough	A-3b	May-November	Ps,COsr,Pp,Ssr,DVp,COs,Sr,COp,Psr	Johnson and Coleman, 2014.
82	Unnamed stream(s), Carry Inlet Lagoon, Big Bay Creek, SW Redfox Creek, Blue Fox Creek	A-3b	May-November	Ps,COr,DVp,COs,COsr,Pp,Sp,COp, Psr,Psr,Ssr,CHsr	Johnson and Coleman, 2014.
83	Unnamed stream(s), Long Lagoon, Devil Inlet Creek	A-3b	May-November	COs,Pp,Ss,DVp,SHp,Ps,CHp,COp,CHsr,Psr,COr,Pr	Johnson and Coleman, 2014.
84	Lower Malina Lake, Upper Malina Lake, Selief, Bear Creek, Unnamed stream(s), Malina Creek	A-3b	May-November	COp,Sp,DVp,SHp,COs,Ss,Ps,Pp,SHs	Johnson and Coleman, 2014.
85	Unnamed stream(s)	A-3b	May-November	Ps	Johnson and Coleman, 2014.
86	California Creek, Little River, Unnamed stream(s)	A-3b	May-November	CHs,COs,Ps,COp,Sp,SHp	Johnson and Coleman, 2014.
87	Unnamed stream(s)	A-3b	May-November	Ps,CHs,COs	Johnson and Coleman, 2014.
88	Sturgeon River, Unnamed stream(s), Karluk River	A-3b	May-November	CHpr,COp,Pp,DVp,SHp,CHs,Ps,COs, CHsr,CHr,COr,Kp,Sr,Ks,Ss,Ssr	Johnson and Coleman, 2014.
89	Unnamed stream(s), Grant Lagoon, Ayakulik River, Sturgeon River	A-3b	May-November	COr,Pr,DVp,Kp,Pp,COs,Ps,DVs,Ks,CHs,COsr,COp,SHp	Johnson and Coleman, 2014.
90	Unnamed stream(s), Ayakulik River, Red River	A-3b	May-November	CHsr,COsr,Psr,DVp,Ss,CHs,COs,Ps, CHp,COp,Kp,Pp,Sp,SHp	Johnson and Coleman, 2014.
91	Olga Creek, Big Sukhoi, Unnamed stream(s)	A-3b	May-November	CHsr,COp,Pp,Sp,DVp,SHp,CHs,COsr,CHp	Johnson and Coleman, 2014.
92	Unnamed stream(s), Little Sukhoi	A-3b	May-November	CHp,Pp,CHs,Ssr	Johnson and Coleman, 2014.
93	Mark Lake, Unnamed stream(s)	A-3b	May-November	Sp,Ps,CHs,COp,Pp,CHp,COr	Johnson and Coleman, 2014.
94	Unnamed stream(s)	A-3b	May-November	COr,COp,COs,CHp,Ps	Johnson and Coleman, 2014.
95	Unnamed stream(s)	A-3b	May-November	Pp	Johnson and Coleman, 2014.
98	Unnamed stream(s), Seven Rivers, Humpy River, East Portage Creek	A-3b	May-November	CHpr,Ppr,Sp,DVp,Pp,Ssr,CHr,Pr,Ps,CHp,COp,CHs,CHsr	Johnson and Coleman, 2014.
99	Unnamed stream(s), Japanese Bay, Rolling Bay, Avnulu Creek, Kaiugnak Point, NE Portage	A-3b	May-November	Pp,CHs,Ps,DVp,CHp,CHsr,COsr	Johnson and Coleman, 2014.
100	Unnamed stream(s), Lagoon Creek Headwaters, Natalia Cabin Creek, Rolling Bay, Ranch Creek, Fugitive Creek, Kuingcuk Creek, Sculpin Creek	A-3b	May-November	Pp,Ps,CHs,DVp,COs,Sp,Ss,COp,COpr,COr,Psr,CHsr,CHp	Johnson and Coleman, 2014.
101	Unnamed stream(s)	A-3b	May-November	CHs,Ps,COs,DVp,Pp,CHp,Ss	Johnson and Coleman, 2014.
102	Miam, Lake, Unnamed stream(s), Rose Tead, Lake, Zenter Stream, Delta Creek, Wild Creek, Saltery Creek	A-3b	May-November	CHs,COs,Pp,Ss,DVp,SHp,COp,Kp,Sp,Ps,COsr,Sr,COr,CHp,Ks,CHsr	Johnson and Coleman, 2014.
103	Chiniak Lake, Unnamed stream(s), Roslyn Creek, West Fork Twin Creek, Twin Creek, East Fork Twin Creek, Chiniak River, Chiniak Lagoon Creek, Sacramento River, Myrtle Creek, Kalsin Creek, Olds River, Kalsin Pond, Franks Creek, Little Navy Creek, Sequel Point Creek, Saturn Creek, Little Creek, Chiniak Springs, Big Creek	A-3b	May-November	COsr,COs,Ps,DVp,Psr,CHs,Pp,COr,COp,Pr,COpr,CHsr	Johnson and Coleman, 2014.
104	Unnamed stream(s), Orbin, Lake, Mayflower Lake, Panamaroff Creek, Devils Creek, Sargent Creek, Salonie Creek, Mayflower Creek, Russian Creek, Salt Creek, American River, Brechan's Channel, Cliff Point Creek	A-3b	May-November	CHs,COr,Ps,COsr,DVp,COs,CHp,Pp, COp,DVr,Pr,Ksr,Ssr,Sp,Ss,DVs	Johnson and Coleman, 2014.
105	Otmeloi Point Creek, Monashka Creek, Unnamed stream(s), Buskin Lake, Catherine, Lake, Island Lake, Dark Lake, Beaver Lake, Mission Lake, Potatopatch Lake, Seredni Point Creek, Virgina Creek, Pillar Creek, Red Cloud River, Buskin River, Devils Creek, Bear Creek, Hollie Creek, Elbow Creek, Battery Creek	A-3b	May-November	CHsr,COs,Ps,COp,CHp,Kp,Ss,DVp,COsr,Pp,Sp,CHs,DVr,COr,CHr,Pr,Sr,SHr,DVs,Ksr,Psr,Ssr,DVpr,SHsr,SHs	Johnson and Coleman, 2014.
106	Unnamed stream(s)	A-3b	May-November	COsr,Ps,COp,Pp	Johnson and Coleman, 2014.
107	Afognak River, Unnamed stream(s), Crack Creek	A-3b	May-November	CHs,COp,Pp,Ss,DVp,SHp,Ps,Sp,COr, COs,COsr	Johnson and Coleman, 2014.

LS ID	Name	Map	Vulnerable	Specific Resource	Reference
108	Unnamed stream(s), Little Kitoi Lake, Little Afognak Lake, Big Kitoi, Portage Creek, Lefthand Bay	A-3b	May-November	COsr,Ps,COr,COs,Ss,Sp,COp,Pp,DVp,SHp,CHp,COpr,Pr,CHsr,SHr	Johnson and Coleman, 2014.
109	Unnamed stream(s)	A-3b	May-November	CHp,COs,Ps,DVp,Pp,Ss,COr	Johnson and Coleman, 2014.
111	Pauls Lake, Laura Lake, Gretchen Lake, Portage Lake, Otter Lake, Unnamed stream(s), South Creek, Portage Creek	A-3b	May-November	CHp,COp,Pp,Ss,DVp,SHs,COsr,SHp,COr,DVr,Ps,COs,Sp,SHr,Psr,CHsr	Johnson and Coleman, 2014.
112	Pauls Lake, Unnamed stream(s), Big Bay Creek, East Shangin Bay, Little Waterfall Creek	A-3b	May-November	CHp,COp,Pp,Ss,DVp,SHs,COr,Ps,COs,COsr,Ssr,Psr	Johnson and Coleman, 2014.

Key:

AC	Arctic Char	CH	Chum Salmon	DV	Dolly Varden	LP	Lamprey, undifferentiated	SM	Smelts, undifferentiated	W	Whitefishes, undifferentiated	p	present
AL	Arctic Lamprey	CO	Coho Salmon	OU	Eulachon	PC	Pacific Lamprey	S	Sockeye Salmon	m	migration	r	rearing
K	Chinook Salmon	CT	Cutthroat Trout	HW	Humpback Whitefish	P	Pink Salmon	SH	Steelhead Trout	s	spawning		

Source: USDOI, BOEM, Alaska OCS Region (2015).

Table A.1-13. Environmental Resource Areas and Grouped Land Segments Used in the Analysis of Oil Spill Effects on Lower Trophic Level Organisms.

ERA ID	Name	Map	Vulnerable	Specific Resource	Reference
11	Augustine	A-2a	January-December	Clams, Scallops, Seagrass	NPFMC, 2014 (pp. 29-35).
153	Polly Creek Beach	A-2a	January-December	Clams, Seagrass	Lees and Driskell, 2006 (Table 4, pp. 19-2,Table 5, pp. 23, Table 6, pp. 25-27).
154	Chinitna Bay	A-2a	January-December	Clams	Lees and Driskell, 2006 (Fig. 2, pp. 5, Table 6, pp 25-27).
155	Barren Islands	A-2a	January-December	Crabs	Bechtel and Gustafson, 2002 (pp. 2-5, 19-25).
GLS ID					
138	Clam Gulch Critical Habitat	A.1-4a	January-December	Clams	Kerkvliet and Booz, 2013 (Table 1, pp. 23, Table 2, p. 24).

Source: USDOI, BOEM, Alaska OCS Region (2015).

Table A.1-14. Grouped Land Segments Used in the Analysis of Oil Spill Effects on Terrestrial Mammals.

GLS ID	Name	LSs	Map	Vulnerable	Specific Resource	Reference
117	Spring Bear Concentration-2	4-9	A-4a	March-May	Brown Bears	ADFG, 1985b, 2014.
118	Bear Feeding Concentration -1	4-9	A-4b	June-August	Brown Bears	ADFG, 1985b, 2014.
121	Spring Bear Concentration-3	10-14	A-4b	March-May	Brown Bears	ADFG, 1985b, 2014.
125	Spring Bear Concentration-1	21-23	A-4a	March-May	Brown Bears	ADFG, 1985b, 2014.
129	Redoubt Bay Brown Bears	37-40	A-4a	March -October	Brown Bear (Spring, Summer, Fall)	ADFG, 1994
131	Trading Bay Moose	40-42	A-4a	Decmber-March	Moose (wintering)	ADFG, 1985a, 1994.
132	Susitna Flats Black Bear	43-46	A-4a	April-June	Black Bear	ADEC, 1997, ADFG, 1985a.
133	Susitna Flats Moose	43-46	A-4a	December-June	Moose (wintering and calving areas)	ADFG, 1985a, 1988.
136	West Kenai Brown Bears	52-59	A-4a	June-October	Brown Bear (feeding areas)	ADFG, 2015a.
140	West Kenai Black Bears	59-62	A-4a	June-October	Black Bear (feeding areas)	ADFG, 2015a.
137	West Kenai Moose	53-55	A-4a	October-May	Moose (Rutting, wintering and calving)	ADFG, 1985a, 2015a.
150	Montague Blacktail Deer	76-78	A-4b	December-March	Blacktail Deer (wintering area)	ADFG, 1985a.
155	Afognak & Raspberry Winter Elk	81-85, 106-112	A-4a	December-March	Elk (Wintering)	ADFG, 1985b, 2014.
157	Afognak Blacktail Deer	82-85, 107-109, 111-112	A-4b	December-March	Blacktail Deer (wintering area)	ADFG, 1985b.
160	Kodiak Blacktail Deeer	89-95, 99-105	A-4a	December-March	Blacktail Deer (wintering area)	ADFG, 1985b.

Source: USDOI, BOEM, Alaska OCS Region (2015).

Table A.1-15. Land Segments and Grouped Land Segments Used in the Analysis of Oil Spill Effects on Parks, Refuges and Special Areas.

ID	Name	LSs	Map	Vulnerable	Specific Resource	Reference
LS ID						
35	Tuxedni State Game Refuge	35	A-3c	January-December	State Game Refuge	SOA, 2014a.
38	Kalgin Island Critical Habitat	38	A-3c	January-December	State Critical Habitat Area	SOA, 2014b; ADFG, 2015b.
GLS ID						
113	Alaska Peninsula NWR	01-09, 11-15	A-4a	January-December	National Wildlife Refuge	USFWS, 2010, 2015a.
114	AMNWR SW Shelikof/GOA	1-17	A-4b	January-December	National Wildlife Refuge	USFWS, 2010, 2015b.
120	Aniakchak National Monument & Preserve	10-11	A-4b	January-December	National Monument and Preserve	NPS, 2015a.
122	Becharof NWR	16-18	A-4b	January-December	National Wildlife Refuge	USFWS, 2010, 2015c.
123	Katmai National Park	19-27	A-4a	January-December	National Park	NPS, 2015b.
126	McNeil River State Game Sanctuary & Refuge	27-28	A-4a	January-December	State Game Sanctuary and Refuge	ADFG, 2015c.
127	AMNWR W Cook Inlet	27-29, 31-33, 35-36	A-4a	January-December	National Wildlife Refuge Tuxedni Bay and islands along Cook Inlet's western coast.	USFWS, 2010, 2015b.
128	Lake Clark National Park & Preserve	33-36	A-4a	January-December	National Park and Preserve	KPB, 2015, NPS, 2015c.
130	Redoubt Bay CHA & Trading Bay SGR	39-40	A-4a	January-December	State Critical Habitat Area and State Game Refuge	ADFG, 1994, 2015d.
134	Susitna Flats State Game Refuge	43-46	A-4a	January-December	State Game Refuge	ADFG, 1988, 2015e.
135	Kenai AK State Rec Mgmt Areas	51-57	A-4a	January-December	State Recreation Areas & State Special Management Areas: Anchor River SRA, Captain Cook SRA, Deep Creek SRA, Kasilof River SRA, Kenai River Special Management Area	ADNR, 2015a, 2015b, 2015c, 2015d, 2015e, KPB, 2015.
138	Clam Gulch Critical Habitat	54-56	A-4a	January-December	State Critical Habitat Area	ADFG, 2015f.
139	Kachemak Bay State Park and Wilderness Park Kachemak Bay State Critical Habitat Area	59-60, 64-67	A-4b	January-December	State Park and Wilderness Park, State Critical Habitat Areas	ADFG, 1993, 2015g, KPB, 2015, ADNR, 2015f.
142	AMNWR E Cook Inlet	60-62	A-4b	January-December	National Wildlife Refuge	USFWS, 2010, 2015b.
143	AMNWR W Outer Kenai/GOA	63-66	A-4b	January-December	National Wildlife Refuge	USFWS, 2010, 2015b.
144	Kenai Fjords National Park	66-71	A-4b	January-December	National Park	KPB, 2015., NPS, 2015d.
145	AMNWR E Outer Kenai/GOA	67-73	A-4b	January-December	National Wildlife Refuge	USFWS, 2010, 2015b.
147	Chugach National Forest	72-78	A-4b	January-December	National Forest	USFS, 2015.
153	Shuyak Island State Park	81-82, 112	A-4a	January-December	State Park	ADNR, 2015g.
154	AMNWR Afognak and Shuyak Islands	81-84, 106-112	A-4a	January-December	National Wildlife Refuge	USFWS, 2010, 2015b.
156	Kodiak National Wildlife Refuge	81-101, 110	A-4b	January-December	National Wildlife Refuge	USFWS, 2010, 2015d.
158	AMNWR W Kodiak/Shelikof	85-88, 90	A-4a	January-December	National Wildlife Refuge	USFWS, 2010, 2015b.
161	AMNWR S Kodiak/GOA and Tugidak Island Critical Habitat Area	93-97		January-December	National Wildlife Refuge, State Critical Habitat Areas	ADFG, 1995., 2015g, USFWS, 2015b.
162	AMNWR E Kodiak/GOA	92, 98- 105		January-December	National Wildlife Refuge	USFWS, 2010, 2015c.
163	Woody Island and Buskin River State Recreation Sites	102, 105	A-4b	January-December	State Rec & Special Management Areas	ADNR, 2015h, 2015i.
164	Afognak Island State Park	109-111	A-4a	January-December	State Park	ADNR, 2015j.

Key: AMNWR = Alaska Maritime National Wildlife Refuge; CHA = Critical Habitat Area; E = East; GOA= Gulf of Alaska; NWR= National Wildlife Refuge, S = South; SGR = State Game Refuge; SW= Southwest; W = West.

Source: USDOI, BOEM, Alaska OCS Region (2015).

Table A.1-16. Land Segment ID and the Geographic Place Names within the Land Segment.

ID	Geographic Place Names	ID	Geographic Place Names
1	Stepovak & Ivanoff Bays, Kupreanof Pen.	57	Anchor Point, Anchor River
2	Jacob Island, Perryville	58	Homer, Homer Spit
3	Mitrofania & Chiachi Island, Sosbee Bay	59	Fritz Creek, Halibut Cove
4	Mitrofania & Anchor Bays, Stirni Point	60	China Poot Bay, Gull Island
5	Kuiukta Bay, Seal Cape	61	Barabara Point, Seldovia Bay
6	Warner Bay	62	Nanwalek, Port Graham
7	Castle Bay, Chignik, Chignik Lagoon	63	Elizabeth Island, Port Chatham, Koyuktolik Bay
8	Chignik Bay	64	Chugach Bay, Rocky Bay, Windy Bay
9	Kujulik Bay, Unavikshak Island	65	West Arm Port Dick, Qikutulig & Touglaalek Bays
10	Aniakchak Bay, Cape Kumlik, Kumlik Island	66	Gore Point, Port Dick, Tonsina Bay
11	Amber Bay, Yantarni Bay	67	Nuka Passage, Nuka Bay, Nuka Island
12	Nakalilok Bay, Ugaiushak Island	68	Pye Islands, Surprise Bay
13	Cape Providence, Chiginagak Bay	69	Black Bay, Thunder Bay, Two Arm Bay
14	Agripina Bay, Ashiiak Island, Cape Kilokak	70	Aialik Bay, Harris Bay
15	Cape Kayakliut, Wide Bay	71	Aialik Cape, Aialik Bay, Resurrection Bay
16	Capes Kanatak, Igvak, & Unalishagvak, Portage Bay	72	Cape Resurrection, Day Harbor, Whidbey Bay
17	Cape Aklek, Puale Bay	73	Johnstone Bay, Puget Bay
18	Alinchak Bay, Cape Kekurnoi, Bear Bay	74	Elrington Island, Latouche Island
19	Cape Kubugakli, Kashvik Bay, Katmai Bay	75	Montague Strait, Cape Clear
20	Amalik, Dakavak & Kinak Bays, Cape Iiktugitak, Takli Is.	76	Monatgue Island (a)
21	Kaflia, Kukak, Kuliak & Missak Bays	77	Monatgue Island (b)
22	Devils Cove, Hallo Bay	78	Monatgue Island (c)
23	Cape Chiniak, Swikshak Bay	79	Barren Islands, Ushagat Island
24	Fourpeaked Glacier	80	Amatuli Cove, East & West Amatuli Island
25	Cape Douglas, Sukoi Bay	81	Shuyak Island
26	Douglas River	82	Bluefox Bay, Shuyak Island, Shuyak Strait
27	Akumwarvik Bay, McNeil Cove, Nordyke Island	83	Foul Bay, Paramanof Bay
28	Amakdedulia Cove, Bruin Bay, Chenik Head	84	Malina Bay, Raspberry Island, Raspberry Strait
29	Augustine Island	85	Kupreanof Strait, Viekoda Bay
30	Rocky Cove, Tignagvik Point	86	Uganik Bay Uganik Strait, Cape Ugat
31	Iiamna Bay, Iniskin Bay, Ursus Cove	87	Cape Kuliuk, Spiridon Bay, Uyak Bay
32	Chinitna Point, Dry Bay	88	Karluk Lagoon, Northeast Harbor, Karluk
33	Chinitna Bay	89	Halibut Bay, Middle Cape, Sturgeon Head
34	Iliamna Point	90	Ayakulik, Bumble Bay, Gurney Bay
35	Chisik Island, Tuxedni Bay	91	Low Cape, Sukhoi Bay
36	Redoubt Point	92	Aiaktalik, Alitak Bay, Cape Alitak
37	Drift River, Drift River Terminal	93	Sitkinak Island
38	Kalgin Island	94	Tugidak Island
39	Seal River, Big River	95	Chirikof Island
40	Kustatan River,West Foreland	96	Semidi Islands
41	Chakachatna, McArthur & Middle River, Trading Bay	97	Sutwik Island
42	Beshta Bay	98	Aiaktalik Is., Japanese & Kaguyak Bays, Russian Harbor
43	Tyonek, Chuitna River, Beluga	99	Kiavak Bay, Knoll Bay, Natalia Bay, Rolling Bay
44	Beluga, Theodore, Lewis & Ivan Rivers	100	McCord, Newman, & Ocean Bays, Old Harbor
45	Susitna & Little Susitna Rivers, Big Is., Magot Point	101	Boulder Bay, Outer Right Cape, Kiluida Bay
46	Susitna Flats, Knik Arm	102	Gull Point, Pasagshak Bay, Ugak Bay
47	Fire Island	103	Barry Lagoon, Cape Chiniak, Cape Greville
48	Anchorage, Turnagain Arm	104	Long Island, Chiniak Bay
49	Point Possession, Miller Creek	105	Anton Larsen Bay, Narrow Strait, Kodiak, Spruce Is
50	Moose Point, Otter Creek	106	Afognak Strait, Whale Island, Kizhuyak & Sharatin Bays
51	Bishop Creek, Boulder Point, Swanson River	107	Kazakof Bay, Duck Bay
52	East Forelands, Kenai, Nikiski	108	Izhut Bay, Pillar Cape
53	Kalifornsky, Kasilof River, Kenai River	109	King Cove, Tonki Cape Peninsula
54	Clam Gulch, Kasilof	110	Marmot Cape, Marmot Island, Marmot Strait
55	Deep Creek, Ninilchik, Ninilchik River	111	Seal Bay, Tonki Bay
56	Cape Starichkof, Happy Valley	112	Andreon Bay, Big Fort Is. Big Waterfall & Perenosa Bay

Key: ID = identification (number).
Source: USDOI, BOEM, Alaska OCS Region (2015).

Table A.1-17. Grouped Land Segment ID, Geographic Names, Land Segments ID's which make up the Grouped Land Segment and Vulnerability.

GLS ID	Grouped Land Segment Name	Land Segment ID's	Vulnerable	MAP
113	Alaska Peninsula National Wildlife Refuge	01-09, 11-15	January-December	A-4a 3
114	AMNWR SW Shelikof/GOA	1-17	January-December	A-4b 5
115	SUA: Chignik Lake, Ivanof Bay, Perryville	02-11	January -December	A-4a 3
116	SUA: Chignik Chignik Lagoon	02-15	January–December	A-4a 3
117	Spring Bear Concentration-2	04-09	March-May	A-4a 4
118	Bear Feeding Concentration -1	04-09	June-August	A-4b 5
119	Kuiukta Bay	05-06	January-December	A-4b 5
120	Aniakchak National Monument and Preserve	10-11	January-December	A-4b 5
121	Spring Bear Concentration-3	10-14	March-May	A-4b 5
122	Becharof National Wildlife Refuge	16-18	January-December	A-4a 3
123	Katmai National Park	19-27	January-December	A-4a 2
124	Kukak Bay	21-22	January-December	A-4b 4
125	Spring Bear Concentration-1	21-23	March-May	A-4a 3
126	McNeil River State Game Sanctuary & Refuge	27-28	January-December	A-4a 2
127	AMNWR W Cook Inlet	27-29, 31-33, 35-36	January-December	A-4a 2
128	Lake Clark National Park and Preserve	33-36	January-December	A-4a 1
129	Redoubt Bay Brown Bears	37-40	April-October	A-4a 1
130	Redoubt Bay Critical Habitat Area	39-40	January-December	A-4a 1
131	Trading Bay Moose	40-42	December-March	A-4a 1
132	Susitna Flats Black Bear	43-46	April-June	A-4a 1
133	Susitna Flats Moose	43-46	December-June	A-4a 1
134	Susitna Flats State Game Refuge	43-46	January-December	A-4a 1
135	Kenai AK State Recreation Mgmt Areas	51-61	January-December	A-4a 1
136	West Kenai Brown Bears	52-59	June-October	A-4a 1
137	West Kenai Moose	53-55	October-May	A-4a 1
138	Clam Gulch Critical Habitat	54-56	January-December	A-4a 1
139	Kachemak Bay State Park & Wilderness Park	59-60, 64-67	January-December	A-4b 1
140	West Kenai Black Bears	59-62	Jun-October	A-4a 3
141	Seldovia side Kachemak Bay	59-62	January-December	A-4b 1
142	AMNWR E Cook Inlet	60-62	January-December	A-4b 3
143	AMNWR W Outer Kenai/GOA	63-66	January-December	A-4b 3
144	Kenai Fjords National Park	66-71	January-December	A-4b 3
145	AMNWR E Outer Kenai/GOA	67-73	January-December	A-4b 3
146	Resurrection Bay	71-72	January-December	A-4b 2
147	Chugach National Forest	72-78	January-December	A-4b 1
148	Prince William Sound IBA, AMNWR	74 -78	January-December	A-4b 2
149	Elrington-Bambridge-LaTouche Islands	74-75	January-December	A-4b 2
150	Montague Blacktail Deer	76-78	December-March	A-4b 1
151	Montague Island	76-78	January-December	A-4b 2
152	Barren Islands	79-80	January-December	A-4a 2
153	Shuyak Island State Park	81-82, 112	January-December	A-4a 2
154	AMNWR Afognak and Shuyak Islands	81-84, 106-112	January-December	A-4a 3
155	Afognak & Raspberry Winter Elk	81-85, 106-112	December-March	A-4a 2
156	Kodiak National Wildlife Refuge	81-101, 110	January-December	A-4b 4
157	Afognak Blacktail Deer	82-85, 107-109, 111-112	December-March	A-4b 4
158	AMNWR W Kodiak/Shelikof	85-88, 90	January-December	A-4a 2
159	Kupreanof Strait	85, 106	January-December	A-4a 3
160	Kodiak Blacktail Deer	89-95, 99-105	December-March	A-4a 3
161	AMNWR S Kodiak/GOA	93-97	January-December	A-4b 4
162	AMNWR E Kodiak/GOA	92, 98-105	January-December	A-4b 4
163	Woody Buskin River	102, 105	January-December	A-4b 4
164	Afognak Island State Park	109-111	January-December	A-4a 3

Key: AK=Alaska AMNWR= Alaska Maritime National Wildlife Refuge, E= East, GOA=Gulf of Alaska, IBA=Important Bird Area, S=South, SW=Southwest

Source: USDOI, BOEM, Alaska OCS Region (2015).

Table A.1-18. Cook Inlet Lease Sale 244 Action Area: Assumptions about How Launch Areas are Serviced by Pipelines for the Oil-Spill Trajectory Analysis.

Alternatives 1, 3a, 3b, 3c, 4a, 4b, 5, or 6	
Launch Area	**Serviced by Pipelines**
LA01	PL1
LA02	PL1
LA03	PL2, PL3
LA04	PL2, PL4
LA05	PL2, PL3
LA06	PL2, PL4

Source: USDOI, BOEM, Alaska OCS Region (2015).

Table A.1-19. Lease Sale 244 Action Area: Estimated Mean Number of Large Platform, Pipeline and Total Spills for the Alternatives.

Alternative Number	Alternative Name	Mean Number of Platform/ Well Spills	Mean Number of Pipeline Spills	Mean Number of Spills Total
1, 3a, 3b, 3c, 4a, 4b, 5, or 6	Proposed Action and its Alternatives	0.05	0.19	0.24
2	No Action	0	0	0

Source: USDOI, BOEM, Alaska OCS Region (2015).

Table A.1-20. Lease Sale 244 Action Area: Estimated Chance of One or More Large Platform, Pipeline and Total Spills Occurring for the Alternatives.

Alternative Number	Alternative Name	Percent Chance of One or More Platform/ Well Spills	Percent Chance of One or More Pipeline Spills	Percent Chance of One or More Spills Total
1, 3a, 3b, 3c, 4a, 4b, 5, or 6	Proposed Action and its Alternatives	5	17	22[1]
2	No Action	0	0	0

Note: [1.] Based on mean spill number of 0.243

Source: USDOI, BOEM, Alaska OCS Region (2015).

Table A.1-21. Small Refined and Crude Oil Spills: Range Assumed Showing Total Over the Life and Annual Number and Volume of Spills Over Exploration and Development and Production Activities.

Activity Phase	Estimated Total Number of Small Spills	Estimated Total Volume of Small Spills (bbl)	Estimated Annual Number of Small Spills	Estimated Annual Volume of Small Spills (bbl)
Refined Oil Spills				
Exploration G&G Activities	0-6	0-18	0-2	0-<2 or <14
Exploration & Delineation Drilling Activities	0-4	0-65	0-1	0-5 or 50
Small Crude and Refined Oil Spills				
Development and Production	450	300	13	91[1]

Note: [1] Average volume over 33 years.

Source: USDOI, BOEM, Alaska OCS Region (2015).

Table A.1-22. Small Refined and Crude Oil Spills: Development and Production Activities.

Activity Phase	Estimated Total Number of Small Spills	Estimated Total Volume of Small Spills (bbl)
Development and Production		
Total[1]	Approximately 450	Approximately 300
0- <1 bbl	434	10
0-<50 bbl	16	48
50 - <500	2	252
500-<1,000	0	0

Note: [1.] Total spill number or volumes are rounded to the nearest ten or hundred.

Source: USDOI, BOEM, Alaska OCS Region (2015).

Table A.1-23. Fate and Behavior of a Hypothetical 1, 5, 13, or 50-Barrel Diesel Fuel Oil Spill.

Scenario Element	Summer Spill[1]				Winter Spill[2]			
1 bbl								
Time After Spill in Hours	6	12	24	48	6	12	24	48
Oil Remaining (%)	26	2	0	na	0	na	na	na
Oil Dispersed (%)	55	75	77	na	85	na	na	na
Oil Evaporated (%)	19	22	23	na	15	na	na	na
5 bbl								
Time After Spill in Hours	6	12	24	48	6	12	24	48
Oil Remaining (%)	30	4	0	na	0	na	na	na
Oil Dispersed (%)	52	73	76	na	85	na	na	na
Oil Evaporated (%)	18	23	24	na	15	na	na	na
13 bbl								
Time After Spill in Hours	6	12	24	48	6	12	24	48
Oil Remaining (%)	26	2	0	na	0	na	na	na
Oil Dispersed (%)	55	75	76	na	85	na	na	na
Oil Evaporated (%)	19	23	24	na	15	na	na	na
50 bbl								
Time After Spill in Hours	6	12	24	48	6	12	24	48
Oil Remaining (%)	69	37	7	0	36	5	0	na
Oil Dispersed (%)	21	46	71	76	54	80	84	na
Oil Evaporated (%)	10	17	22	24	10	15	16	na

Notes: Calculated with the SINTEF oil-weathering model Version 4.0 of Reed et al. (2005) and assuming marine diesel, na means not applicable.

[1] Summer (April 1-October 31), 12-knot wind speed, 9 degrees Celsius, 1-meter wave height. Average Marine Weather Area A (Brower et al., 1988)

[2] Winter Spill (November 1-March 31), 16-knot wind speed, 5 degrees Celsius, 1.8- meter wave. Average Marine Weather Area A (Brower et al., 1988)

Table A.1-24 Comparison between VLOS and Worst-Case Discharge Analysis.

Characteristic	VLOS	WCD
Geographic Area of Focus	A broad area described by the Cook Inlet Program Area	A specific location described by an Exploration Plan (EP) or Development and Production Plan (DPP).
Reason for Analysis	The VLOS scenario is hypothetical and is provided as a general planning tool for the entire Program Area.	A WCD always accompanies an industry EP or DPP for a specific site, and provides the basis for an Oil-Spill Response Plan.
Regulatory Basis	A VLOS scenario serves to respond to CEQ regulations regarding a low probability, high impact event	The WCD calculation is required by 30 CFR Part 250.
Estimated Flow Rate	Maximizes estimated flow rate to represent the largest potential discharge estimated from any site in the entire Area ID.	Maximizes estimated flow rate to represent the largest potential discharge from one actual (known) drilling location. This will typically mean lower aggregate discharges than a VLOS.

Table A.1-25. AVALON/MERLIN Discharge Model Results for a Cook Inlet Well VLOS.

Day	Oil Discharge Rate (STB/d)	Gas Discharge Rate (MSCF/d)	Water Discharge Rate (STB/d)	Producing Gas-Oil Ratio (SCF/STB)	Cumulative Oil Discharge (STB)	Cumulative Gas Discharge (MSCF)	Average Reservoir Pressure (psia)	Flowing Bottom-Hole Pressure (psia) at Midpoint of Reservoir	Reservoir Pressure in Simulation Cell Containing Wellbore (psia)
0	0	0	0	0	0	0	3,120	0	3120
1	2,135	899	0	421	2,135	899	3,120	1,594	3,072
2	1,891	796	0	421	4,026	1,695	3,120	1,594	2,824
3	1,800	758	0	421	5,826	2,453	3,116	1,594	2,730
4	1,752	738	0	421	7,578	3,191	3,113	1,594	2,688
5	1,721	724	0	421	9,299	3,915	3,109	1,594	2,662
6	1,697	714	0	421	10,996	4,629	3,106	1,594	2,644
7	1,678	707	0	421	12,674	5,336	3,103	1,594	2,630
8	1,663	700	0	421	14,337	6,036	3,100	1,594	2,618
9	1,650	694	0	421	15,987	6,730	3,096	1,594	2,609
10	1,638	689	0	421	17,625	7,419	3,093	1,594	2,600
11	1,627	685	0	421	19,252	8,104	3,090	1,594	2,593
12	1,618	681	0	421	20,870	8,785	3,087	1,594	2,587
13	1,610	678	0	421	22,480	9,463	3,084	1,594	2,581
14	1,603	675	0	421	24,083	10,138	3,081	1,594	2,575
15	1,596	672	0	421	25,679	10,810	3,078	1,594	2,570
16	1,589	669	0	421	27,268	11,479	3,074	1,594	2,566
17	1,583	667	0	421	28,851	12,146	3,071	1,594	2,562
18	1,576	664	0	421	30,427	12,810	3,068	1,594	2,558
19	1,571	661	0	421	31,998	13,471	3,065	1,594	2,554

Day	Oil Discharge Rate (STB/d)	Gas Discharge Rate (MSCF/d)	Water Discharge Rate (STB/d)	Producing Gas-Oil Ratio (SCF/STB)	Cumulative Oil Discharge (STB)	Cumulative Gas Discharge (MSCF)	Average Reservoir Pressure (psia)	Flowing Bottom-Hole Pressure (psia) at Midpoint of Reservoir	Reservoir Pressure in Simulation Cell Containing Wellbore (psia)
20	1,566	659	0	421	33,564	14,130	3,062	1,594	2,551
21	1,561	657	0	421	35,125	14,787	3,059	1,594	2,547
22	1,557	655	0	421	36,682	15,442	3,056	1,594	2,544
23	1,552	654	0	421	38,234	16,096	3,053	1,594	2,541
24	1,548	652	0	421	39,782	16,748	3,050	1,594	2,538
25	1,544	650	0	421	41,326	17,398	3,047	1,594	2,535
26	1,540	648	0	421	42,866	18,046	3,044	1,594	2,533
27	1,536	647	0	421	44,402	18,693	3,041	1,594	2,530
28	1,533	645	0	421	45,935	19,338	3,038	1,594	2,527
29	1,529	644	0	421	47,464	19,982	3,035	1,594	2,525
30	1,525	642	0	421	48,989	20,624	3,032	1,594	2,522
31	1,522	641	0	421	50,511	21,265	3,029	1,594	2,520
32	1,519	639	0	421	52,030	21,904	3,026	1,594	2,518
33	1,515	638	0	421	53,545	22,542	3,024	1,594	2,516
34	1,512	637	0	421	55,057	23,179	3,021	1,594	2,513
35	1,509	635	0	421	56,566	23,814	3,018	1,594	2,511
36	1,506	634	0	421	58,072	24,448	3,015	1,594	2,509
37	1,502	632	0	421	59,574	25,080	3,012	1,594	2,507
38	1,499	631	0	421	61,073	25,711	3,009	1,594	2,505
39	1,496	630	0	421	62,569	26,341	3,006	1,594	2,503
40	1,493	629	0	421	64,062	26,970	3,003	1,594	2,501
41	1,490	627	0	421	65,552	27,597	3,000	1,594	2,499
42	1,487	626	0	421	67,039	28,223	2,997	1,594	2,497
43	1,484	625	0	421	68,523	28,848	2,994	1,594	2,495
44	1,481	624	0	421	70,004	29,472	2,992	1,594	2,493
45	1,478	622	0	421	71,482	30,094	2,989	1,594	2,491
46	1,475	621	0	421	72,957	30,715	2,986	1,594	2,489
47	1,472	620	0	421	74,429	31,335	2,983	1,594	2,487
48	1,470	619	0	421	75,899	31,954	2,980	1,594	2,485
49	1,467	617	0	421	77,366	32,571	2,977	1,594	2,483
50	1,464	616	0	421	78,830	33,187	2,974	1,594	2,481
51	1,461	615	0	421	80,291	33,802	2,972	1,594	2,479
52	1,458	614	0	421	81,749	34,416	2,969	1,594	2,477
53	1,455	613	0	421	83,204	35,029	2,966	1,594	2,476
54	1,453	612	0	421	84,657	35,641	2,963	1,594	2,474
55	1,450	610	0	421	86,107	36,251	2,960	1,594	2,472
56	1,447	609	0	421	87,554	36,860	2,958	1,594	2,470
57	1,444	608	0	421	88,998	37,468	2,955	1,594	2,468
58	1,441	607	0	421	90,439	38,075	2,952	1,594	2,466
59	1,439	606	0	421	91,878	38,681	2,949	1,594	2,465
60	1,436	605	0	421	93,314	39,286	2,946	1,594	2,463
61	1,433	603	0	421	94,747	39,889	2,944	1,594	2,461
62	1,430	602	0	421	96,177	40,491	2,941	1,594	2,459
63	1,428	601	0	421	97,605	41,092	2,938	1,594	2,457
64	1,425	600	0	421	99,030	41,692	2,935	1,594	2,456
65	1,422	599	0	421	100,452	42,291	2,932	1,594	2,454
66	1,420	598	0	421	101,872	42,889	2,930	1,594	2,452
67	1,417	597	0	421	103,289	43,486	2,927	1,594	2,450
68	1,414	595	0	421	104,703	44,081	2,924	1,594	2,449
69	1,412	594	0	421	106,115	44,675	2,921	1,594	2,447
70	1,409	593	0	421	107,524	45,268	2,919	1,594	2,445
71	1,406	592	0	421	108,930	45,860	2,916	1,594	2,443
72	1,404	591	0	421	110,334	46,451	2,913	1,594	2,441
73	1,401	590	0	421	111,735	47,041	2,911	1,594	2,440
74	1,398	589	0	421	113,133	47,630	2,908	1,594	2,438
75	1,396	588	0	421	114,529	48,218	2,905	1,594	2,436
76	1,393	586	0	421	115,922	48,804	2,902	1,594	2,435
77	1,390	585	0	421	117,312	49,389	2,900	1,594	2,433
78	1,388	584	0	421	118,700	49,973	2,897	1,594	2,431
79	1,385	583	0	421	120,085	50,556	2,894	1,594	2,429
80	1,382	582	0	421	121,467	51,138	2,892	1,594	2,428

Notes: STB/d, stock-tank (surface) barrels per day; MSCF/d, thousands of standard (surface conditions, or 60°F and 1 atmosphere (14.73 psia) cubic feet of gas; psia, pounds per square inch, absolute.Table refers to a very low probability hypothetical VLOS, occurring over a maximum (80-day) time period. The model estimates discharges during mobilization, drilling, and completion of a relief well.

Table A.1-26. Time Required to Drill Relief Well and Kill Discharge following VLOS at a Well.

1. Use of Original Drilling Platform and Equipment to Drill Relief Well	
Activity	**Time Estimate (days)**
Drilling of relief well	18
Killing of VLOS (original) well	5
Estimated Total Time Required	**23**
2. Use of Second Drilling Platform and Equipment to Drill Relief Well	
Activity	**Time Estimate (days)**
Transport of relief well rig to VLOS well site	25-56
Drilling of relief well	18
Killing of VLOS (original) well	5
EstimatedTotal Required Time	***48-79**

Notes: Estimated time periods required to drill a relief well and to kill the discharge at the Cook Inlet VLOS Well (USDOI, BOEMRE, 2011b).

Table A.1-27. Properties and Persistence for Medium Weight Crude Oil.

Medium-weight Crude Oil – Properties and Persistence	
Hydrocarbon compounds	Between 10 and 22 carbon atoms
API º	<31.1º
Evaporation rate	Evaporation rates of up to several days, although there will be some residue which does not evaporate at ambient temperatures
Solubility in water	Low water-soluble fraction (at most a few mg/L)
Acute toxicity	Moderate acute toxicity because they contain diaromatic hydrocarbons (naphthalenes) which are toxic in spite of their low solubilities
Chronic toxicity	Moderate
Bioaccumulation potential	Moderate potential for bioaccumulation and chronic toxicities associated with the diaromatic hydrocarbons
Compositional majority	Alkanes and cycloalkanes
Persistence	Moderate

Sources: Michel, 1992; Reed et al., 2005 (Sintef OWM); Brandvik, Resby, and Daling et al. (2010).

Table A.1-28. Fate and Behavior of a Hypothetical 1,400 to 2,100-Barrel Crude Oil Spill in the Cook Inlet.

	Summer Spill[1]				**Winter Spill[2]**				**Winter Spill (Broken Ice)[2]**			
Time After Spill (Days)	1	3	10	30	1	3	10	30	1	3	10	30
Oil Remaining (%)	84	74	52	24	75	55	22	3	88	84	75	61
Oil Dispersed (%)	11	13	31	56	14	32	62	80	1	3	8	19
Oil Evaporated (%)	5	13	17	20	11	13	16	17	11	13	17	20

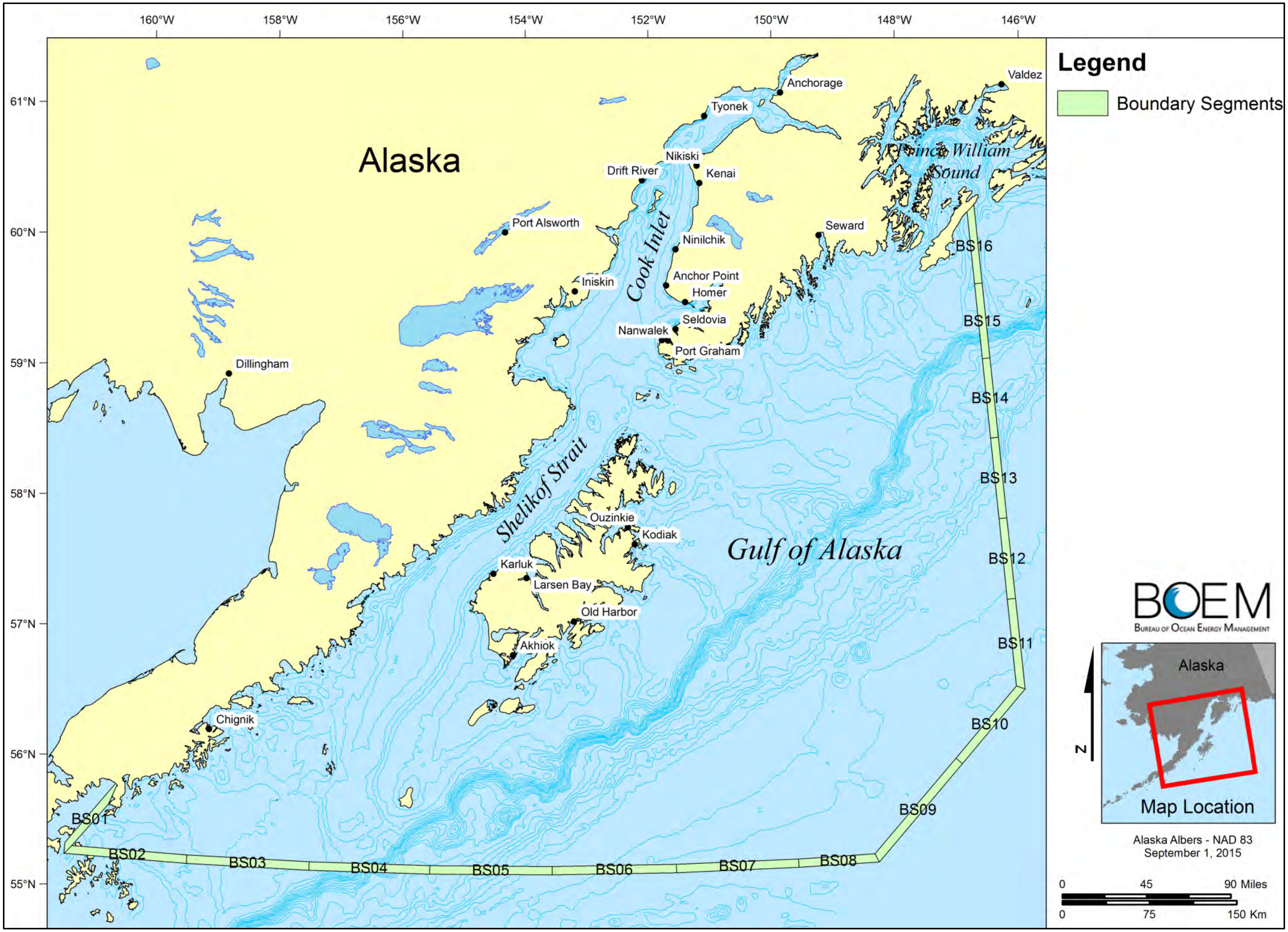
Notes: Calculated with the SINTEF oil-weathering model Version 4.0 of Reed et al. (2005) and assuming a Medium Crude Oil of 20-25º API

[1] Summer (April 1-October 31), 12-knot wind speed, 9 degrees Celsius, 1-meter wave height. Average Marine Weather Area A (Brower et al., 1988)

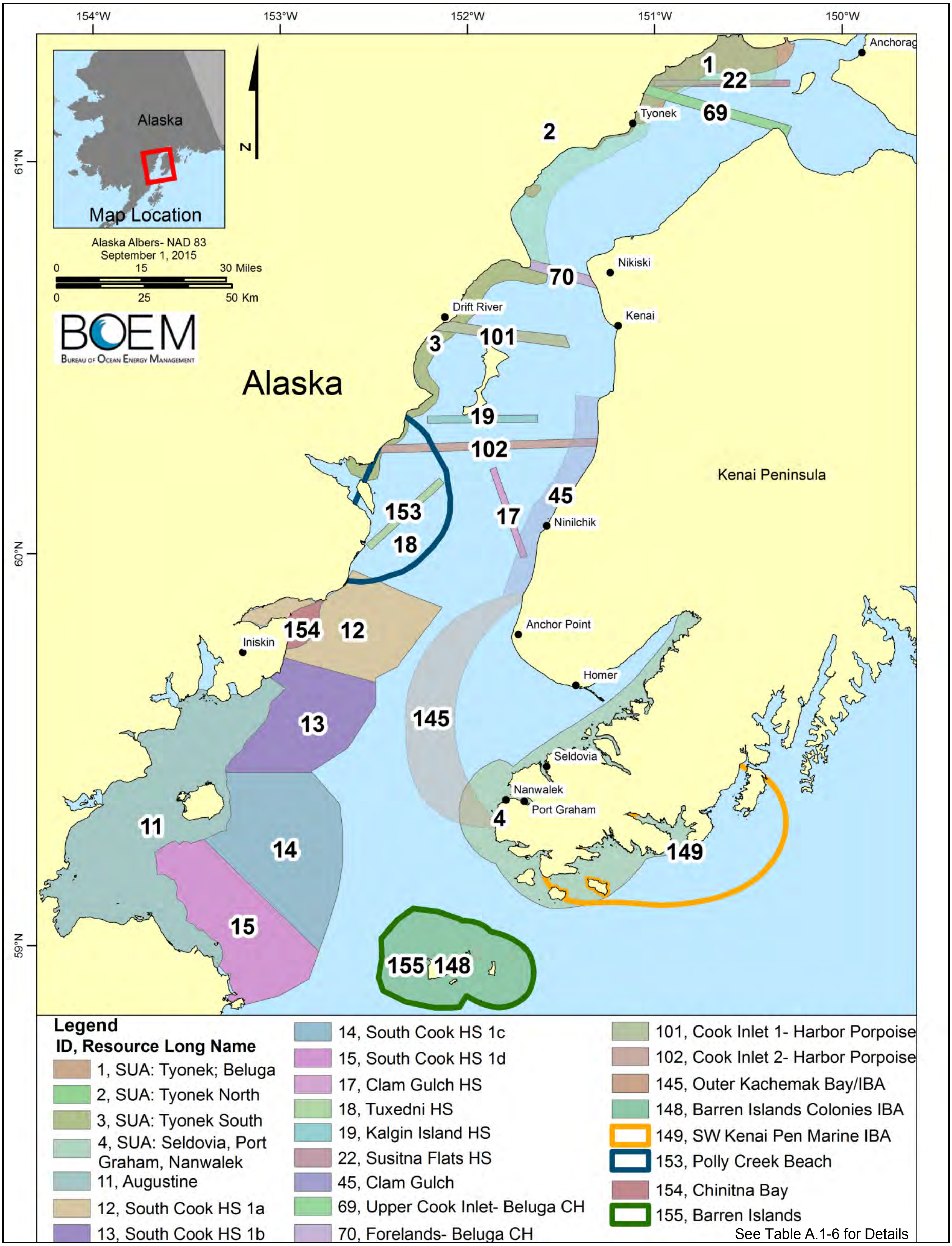
[2] Winter Spill (November 1-March 31), 16-knot wind speed, 5 degrees Celsius, 1.8- meter wave heights and for Broken Ice 50% ice. Average Marine Weather Area A (Brower et al., 1988)

Source: USDOI, BOEM, Alaska OCS Region (2015).

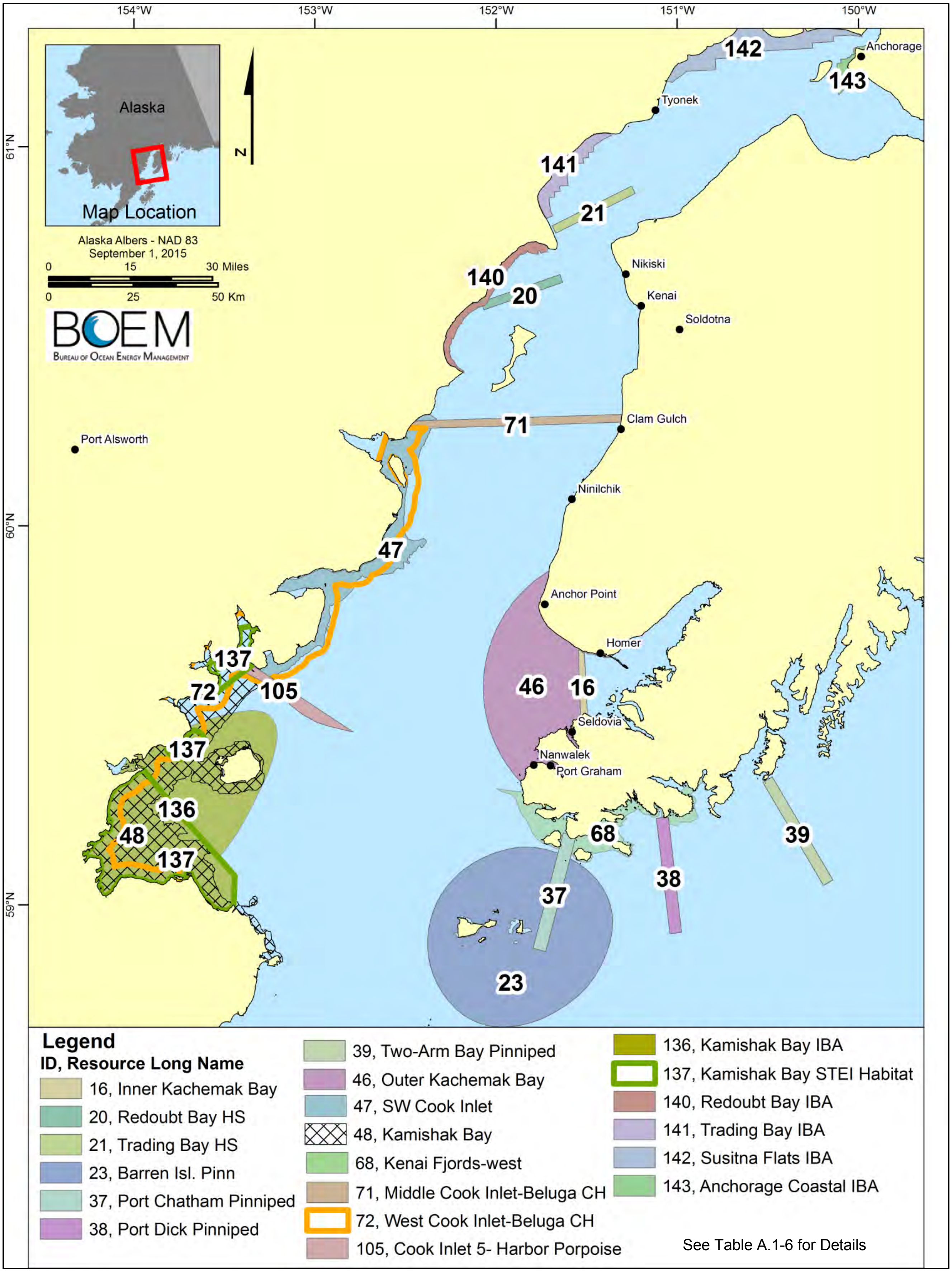
Appendix A Maps



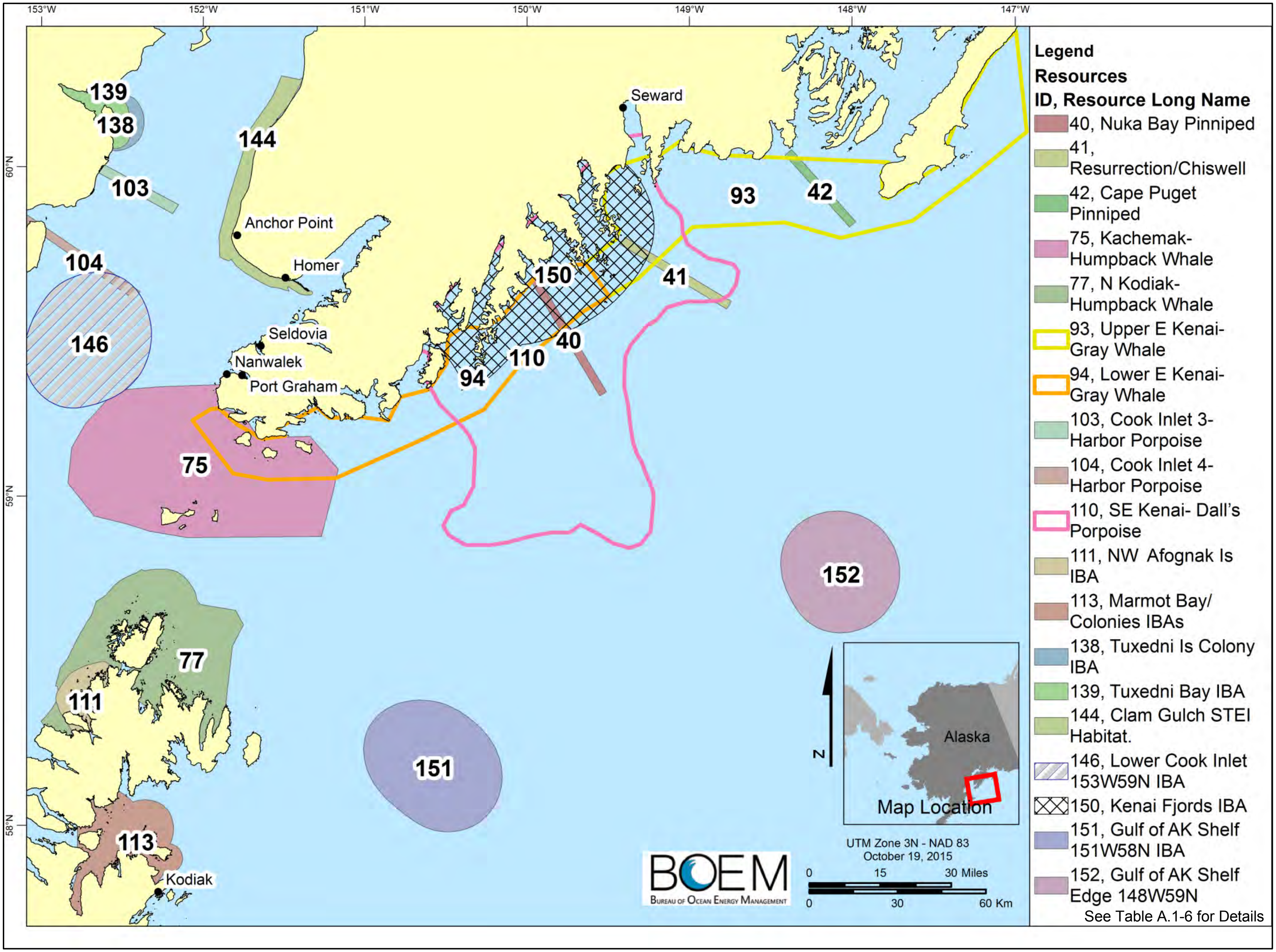
Map A-1. Study Area Used in the Oil-Spill Trajectory Analysis.



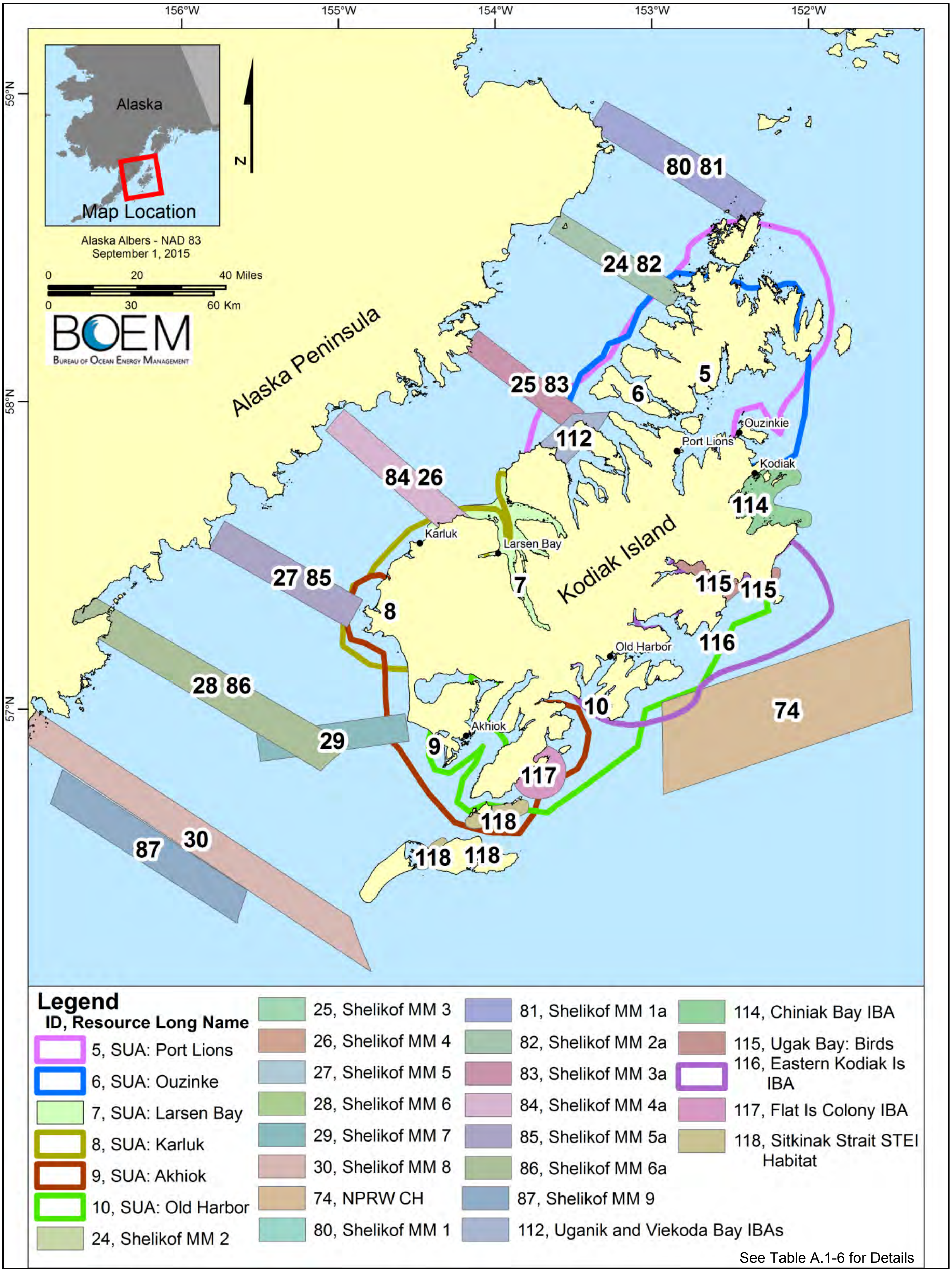
Map A-2a. Environmental Resource Areas Used in the Oil-Spill Trajectory Analysis.



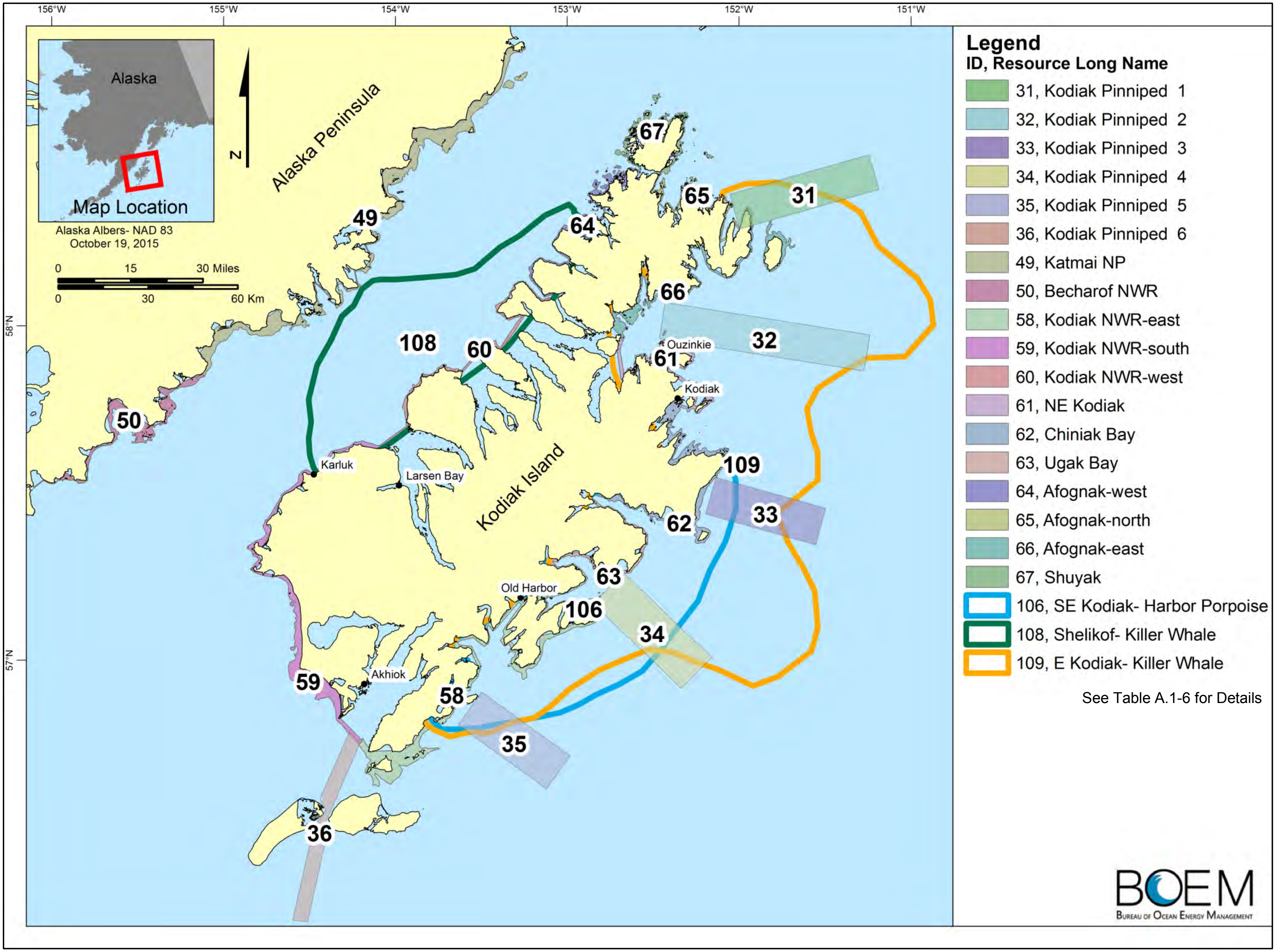
Map A-2b.Environmental Resource Areas Used in the Oil-Spill Trajectory Analysis.



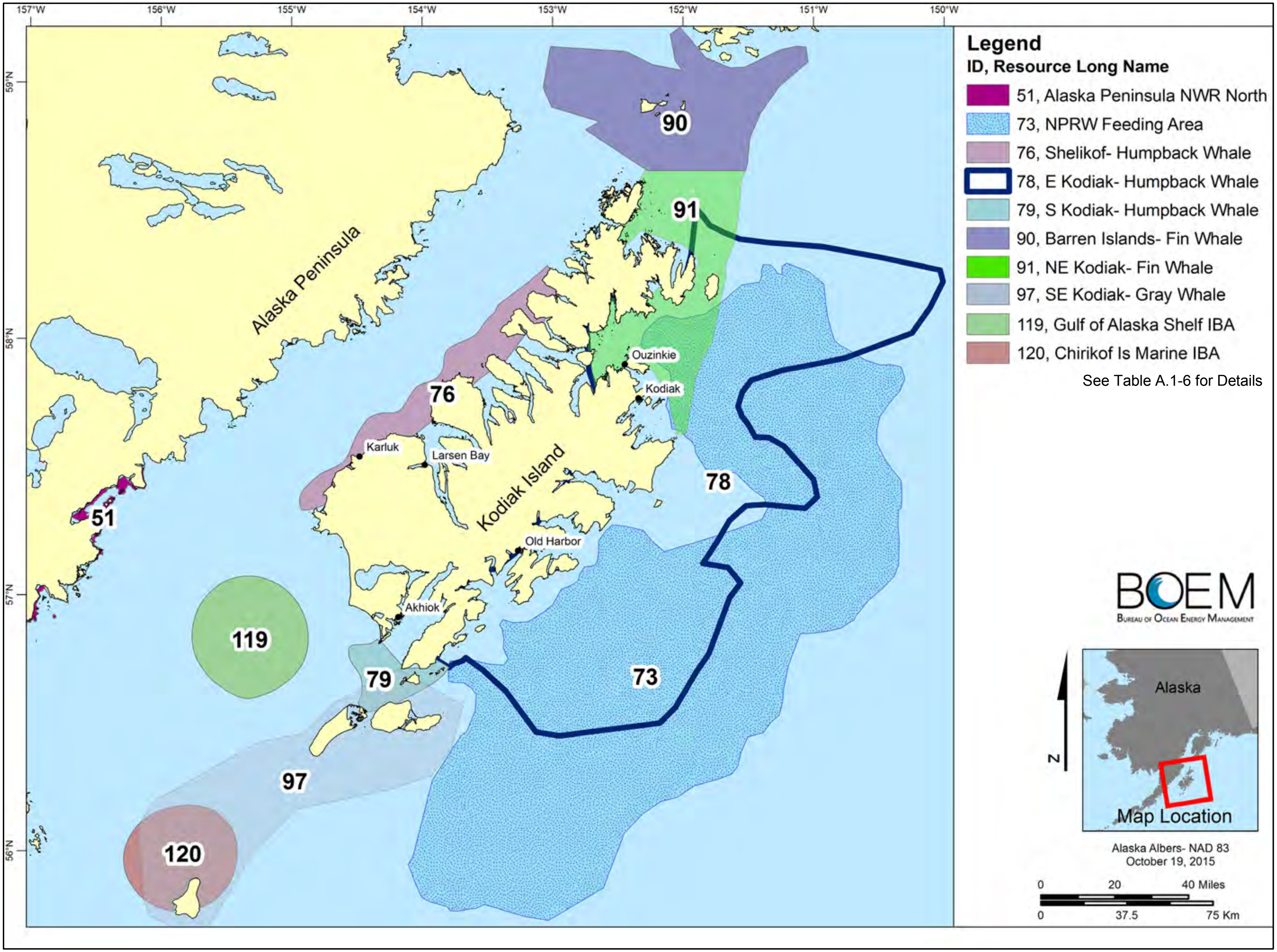
Map A-2c. Environmental Resource Areas Used in the Oil-Spill Trajectory Analysis.



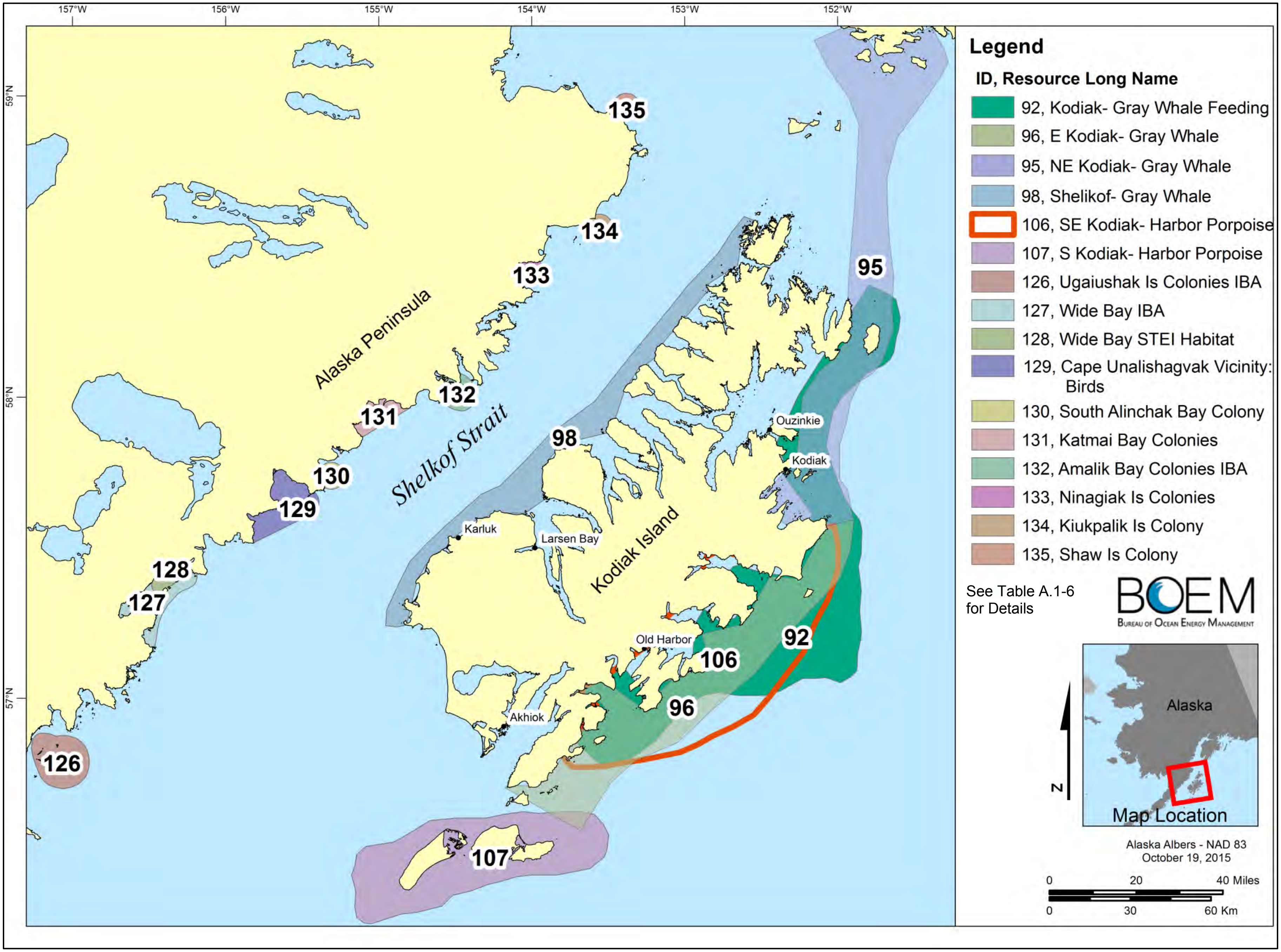
Map A-2d.Environmental Resource Areas Used in the Oil-Spill Trajectory Analysis.



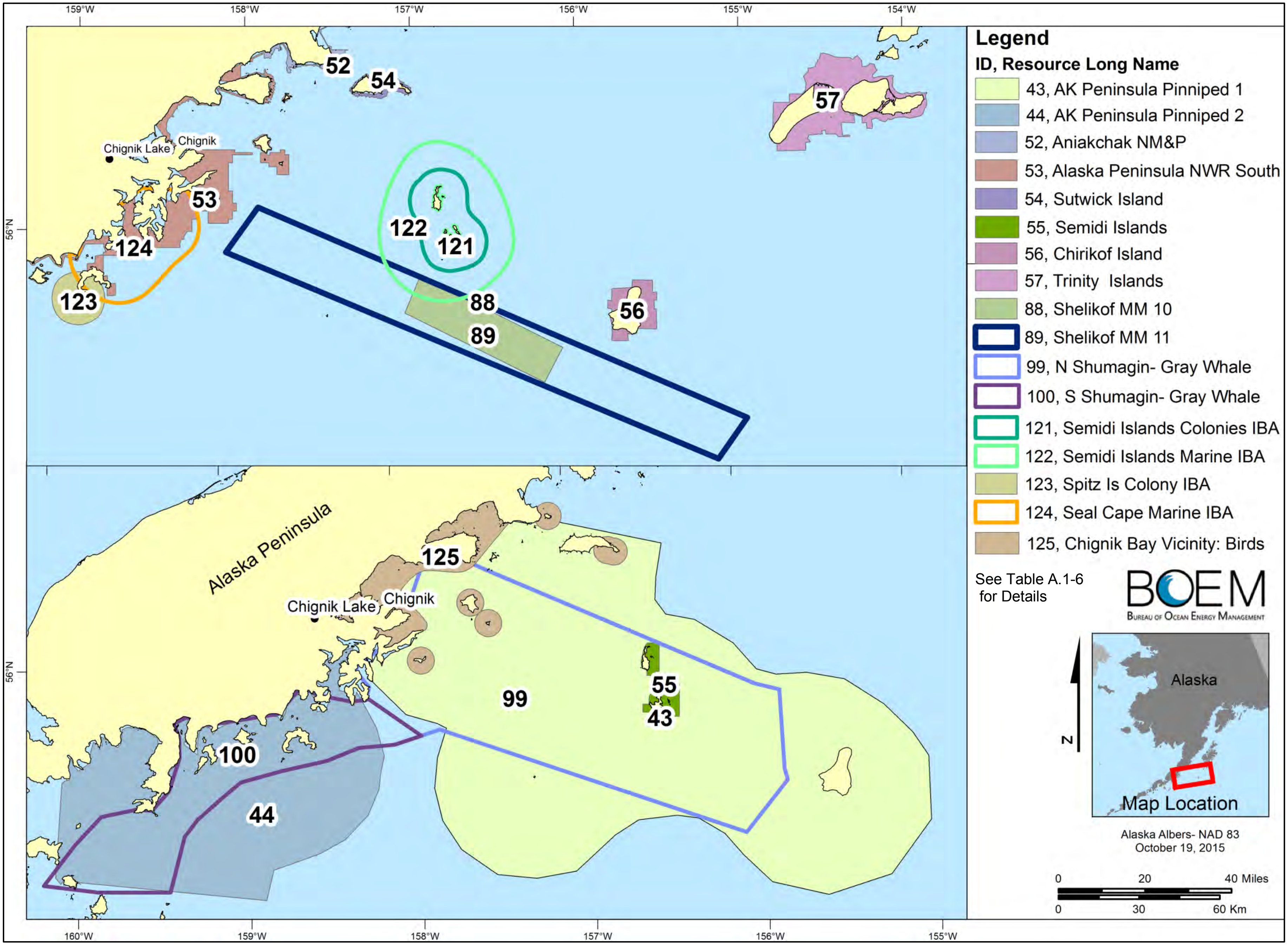
Map A-2e.Environmental Resource Areas Used in the Oil-Spill Trajectory Analysis.



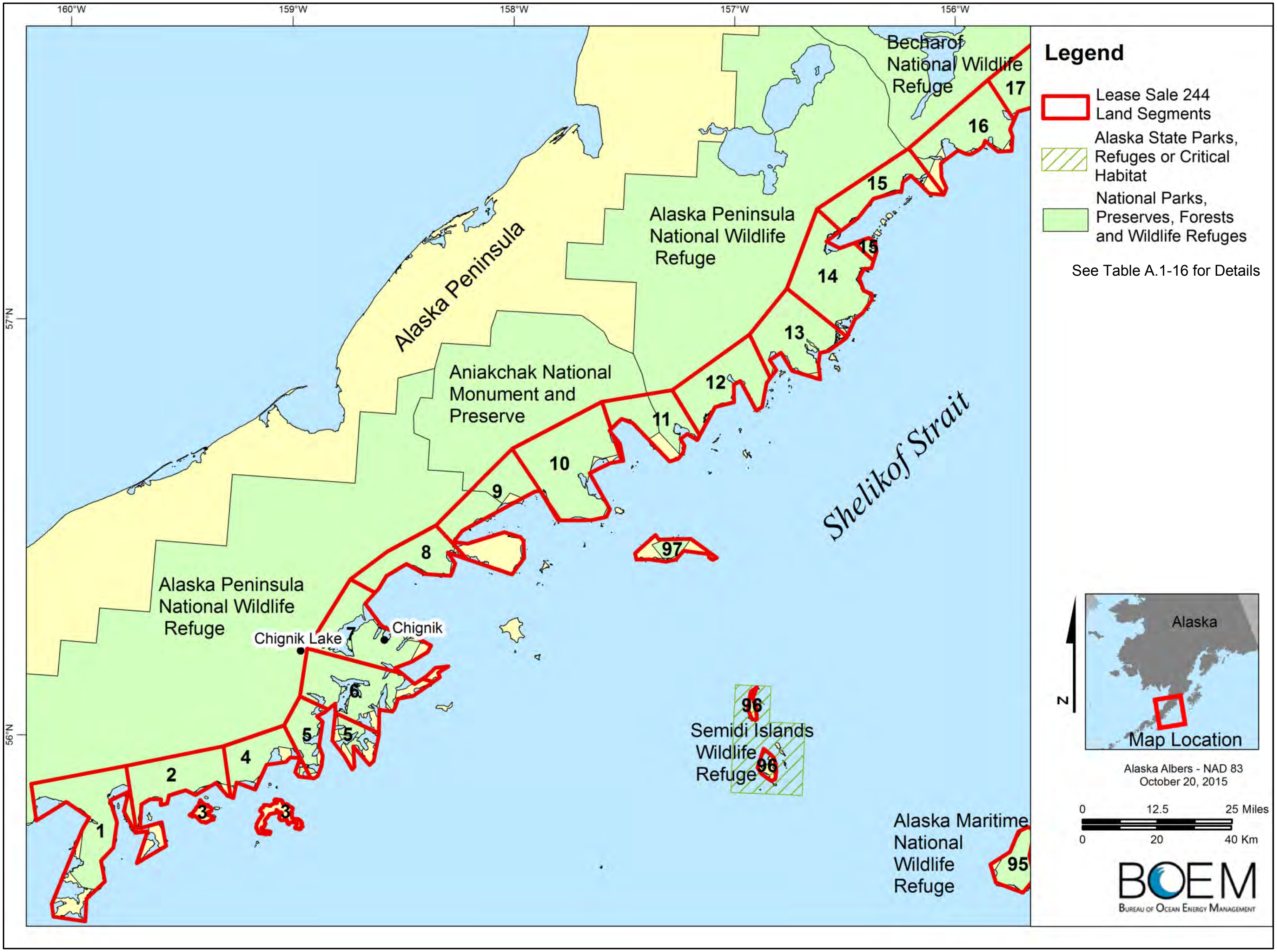
Map A-2f. Environmental Resource Areas Used in the Oil-Spill Trajectory Analysis.



Map A-2g. **Environmental Resource Areas Used in the Oil-Spill Trajectory Analysis.**



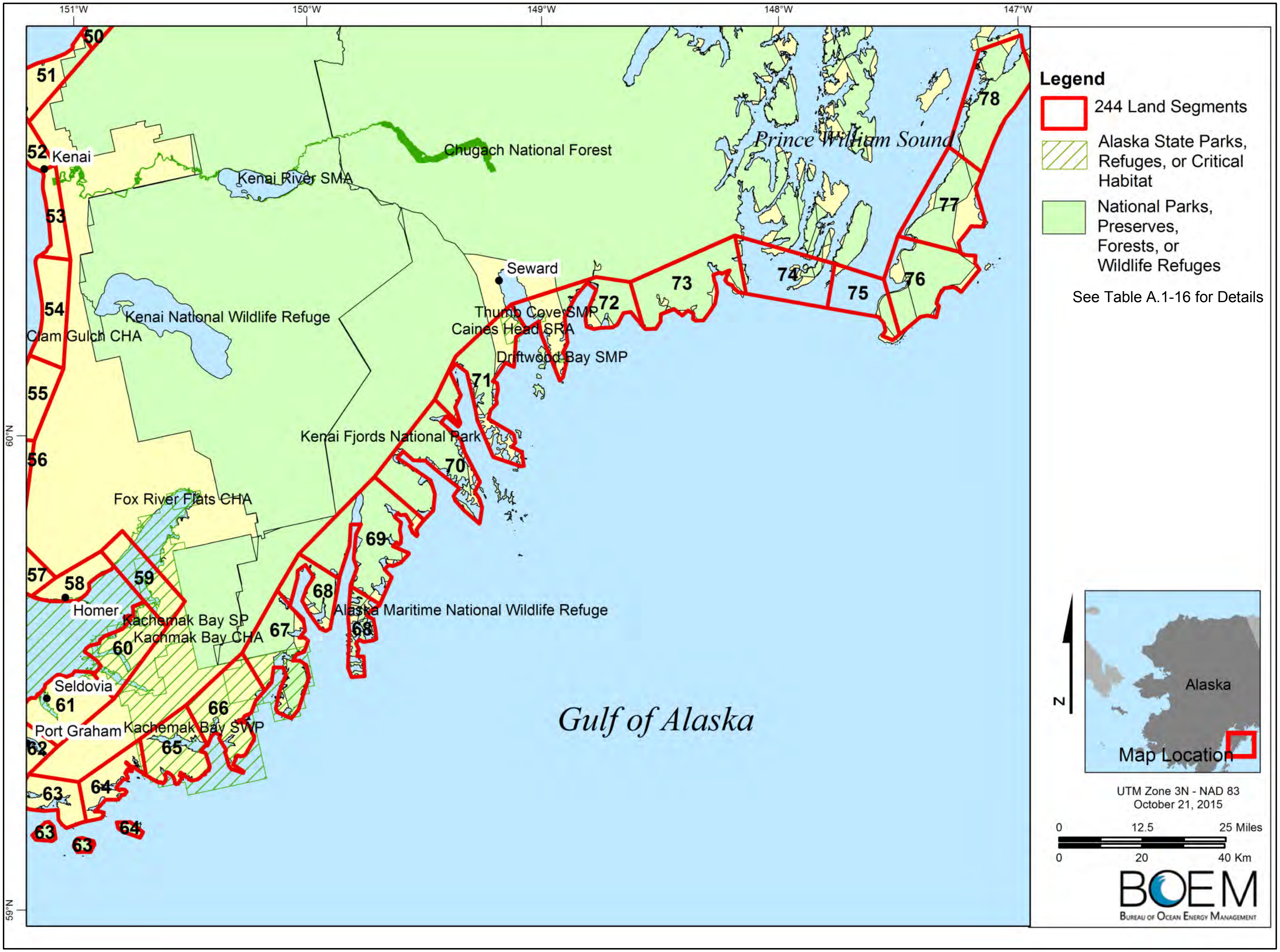
Map A-2h. **Environmental Resource Areas Used in the Oil-Spill Trajectory Analysis.**



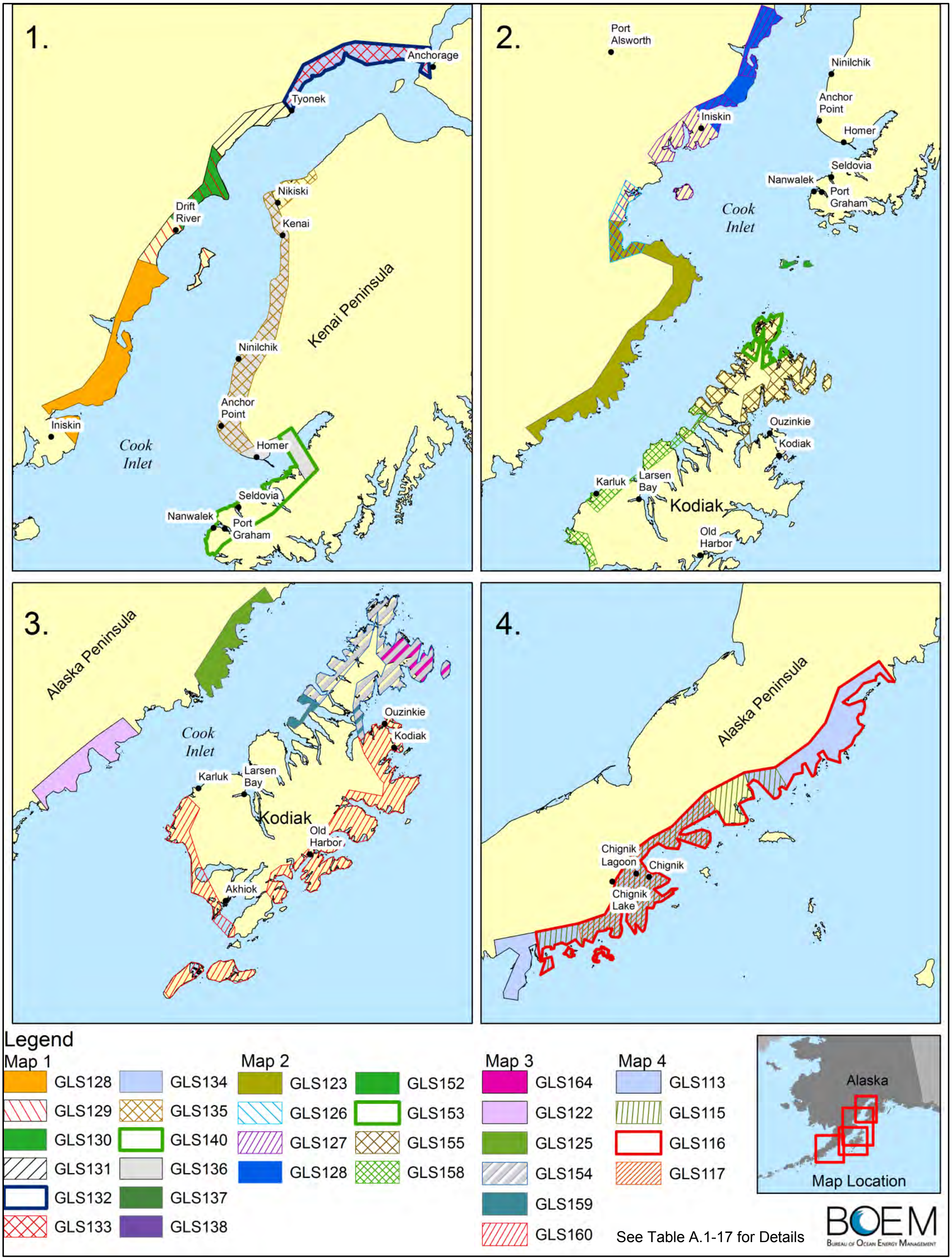
Map A-3a. Land Segments Used in the Oil-Spill Trajectory Analysis.

Map A-3b. Land Segments Used in the Oil-Spill Trajectory Analysis

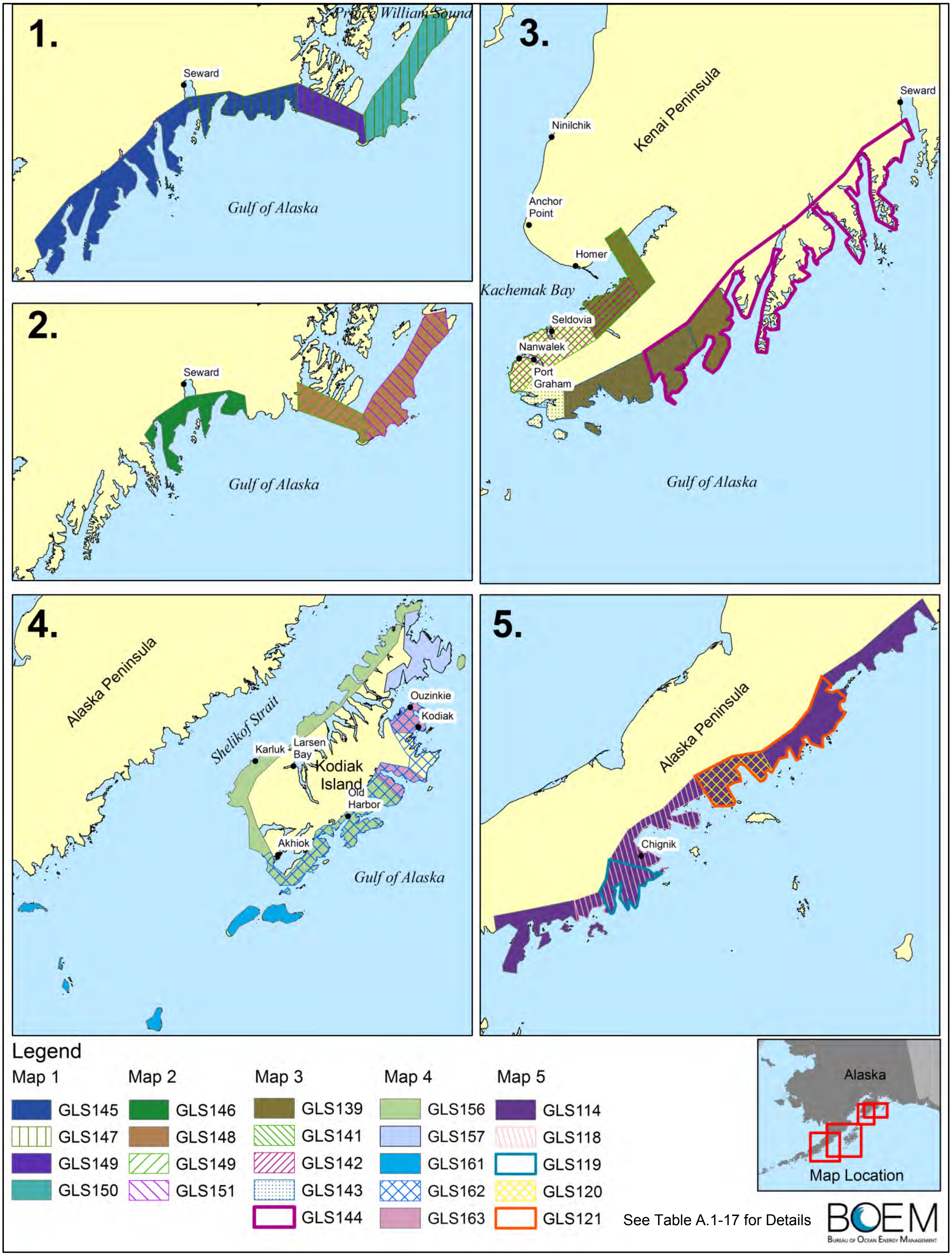
Map A-3c. Land Segments Used in the Oil-Spill Trajectory Analysis.



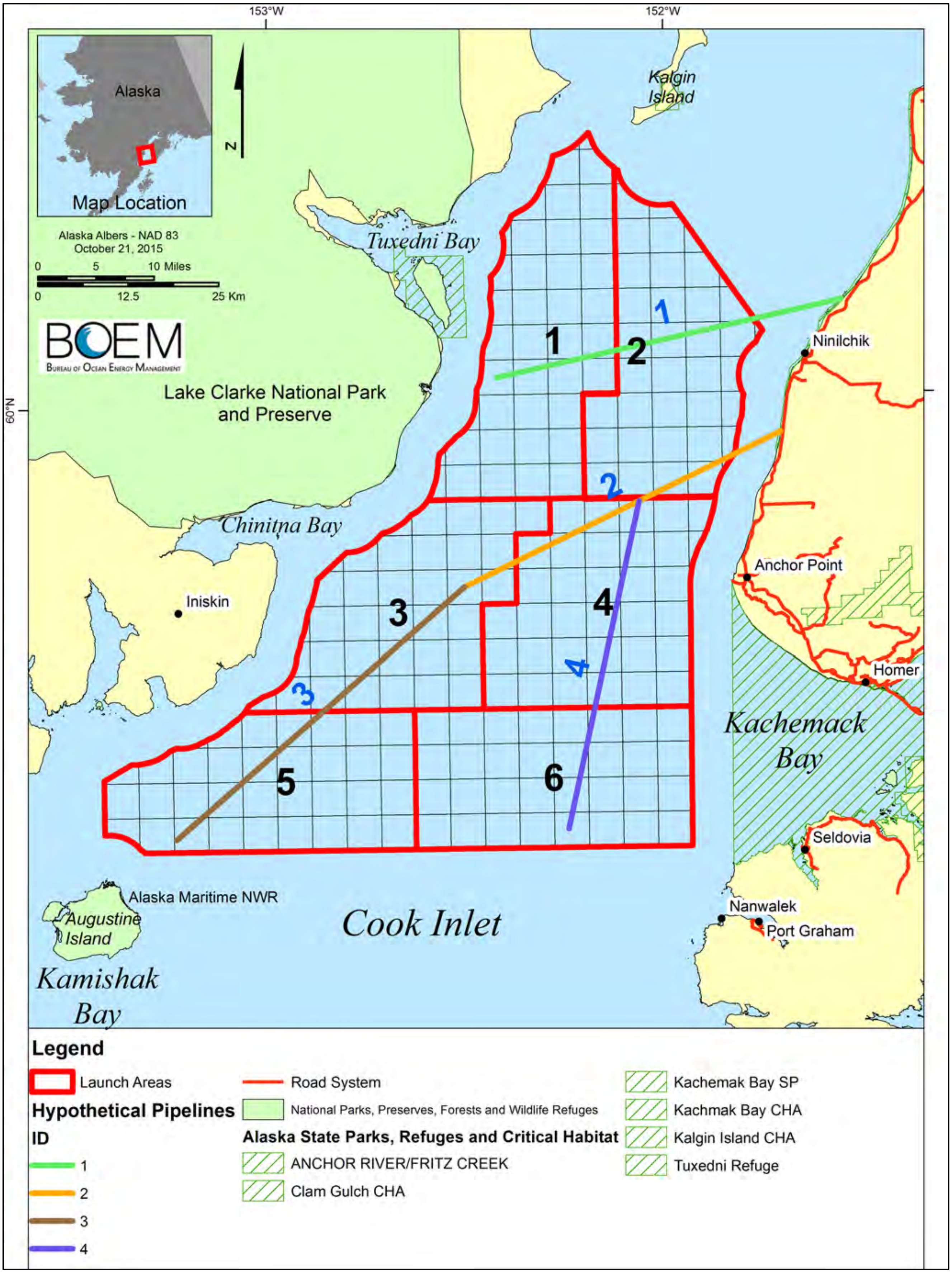
Map A-3d. Land Segments Used in the Oil-Spill Trajectory Analysis.



Map A-4a. Grouped Land Segments Used in the Oil-Spill Trajectory Analysis.



Map A-4b. Grouped Land Segments Used in the Oil-Spill Trajectory Analysis.



Map-A-5. Hypothetical Launch Areas and Pipelines Used in the Oil-Spill Trajectory Analysis.

A.2. OSRA Conditional and Combined Probability Tables

Tables A.2-1 through A.2-60 represent conditional probabilities (expressed as percent chance) that a large oil spill starting at a particular location (launch area (LA) or pipeline (PL) will contact a certain location (environmental resource area, land segment, boundary segment, or grouped land segment). The tables are further organized as annual or seasonal (winter, summer). Tables A.2-1 through A.2-20 represent annual conditional probabilities while Tables A.2-21 through A.2-60 represent seasonal conditional probabilities. Tables A.2-61 through A.2-64 represent combined probabilities (expressed as percent chance) of one or more large spills, and the estimated number of spills (mean), occurring and contacting a resource over the assumed life of the Lease Sale 244 Action Area, Alternatives 1, 3a, 3b, 3c, 4a, 4b, 5, or 6. If the chance of contacting a given resource area is >99.5%, it is shown with a double asterisk (**). If the chance of a large spill contacting a resource area is <0.5%, it is shown with a dash (-). Resources with a <0.5% chance of contact from all LAs and PLs are not shown.

Tables A.2-1 through A.2-5 represent annual conditional probabilities (expressed as percent chance) that a large oil spill starting at a particular location will contact a certain environmental resource area (ERA) within:

Table A.2-1. 1 Days-(Annual-ERA).

ID	Environmental Resource Area Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
0	Land	25	8	14	2	11	2	9	6	9	1
3	SUA: Tyonek South	13	2	-	-	-	-	1	-	-	-
4	SUA: Seldovia, Port Graham, Nanwalek	-	-	-	1	-	10	-	-	-	4
11	Augustine	1	-	20	1	48	1	-	1	32	-
12	South Cook HS 1a	50	27	83	48	3	11	44	39	42	28
13	South Cook HS 1b	13	2	79	16	85	22	7	8	95	9
14	South Cook HS 1c	-	-	10	-	47	4	-	-	35	1
15	South Cook HS 1d	-	-	-	-	4	-	-	-	3	-
16	Inner Kachemak Bay	-	-	-	1	-	-	-	-	-	-
17	Clam Gulch HS	-	44	-	4	-	-	29	32	-	2
18	Tuxedni HS	32	14	-	-	-	-	24	1	-	-
19	Kalgin Island HS	15	10	-	-	-	-	3	-	-	-
20	Redoubt Bay HS	6	1	-	-	-	-	-	-	-	-
45	Clam Gulch	-	10	-	4	-	-	16	35	-	2
46	Outer Kachemak Bay	-	5	1	37	-	37	1	22	-	28
47	SW Cook Inlet	49	11	28	2	6	-	28	3	10	1
48	Kamishak Bay	-	-	4	-	23	-	-	-	13	-
68	Kenai Fjords-west	-	-	-	-	-	1	-	-	-	1
70	Forelands- Beluga CH	1	-	-	-	-	-	-	-	-	-
71	Middle Cook Inlet-Beluga CH	28	26	-	-	-	-	17	4	-	-
72	West Cook Inlet-Beluga CH	31	7	27	1	15	-	16	2	14	-
75	Kachemak- Humpback Wha	-	-	-	-	2	6	-	-	1	3
90	Barren Islands- Fin Whale	-	-	-	-	1	1	-	-	1	-
94	Lower E Kenai- Gray Whale	-	-	-	-	-	1	-	-	-	-
95	NE Kodiak- Gray Whale	-	-	-	-	-	1	-	-	-	-
101	Cook Inlet 1- Harbor Porpoise	4	-	-	-	-	-	-	-	-	-
102	Cook Inlet 2- Harbor Porpoise	10	10	-	-	-	-	7	2	-	-
103	Cook Inlet 3- Harbor Porpoise	18	13	4	9	-	-	19	11	-	5
104	Cook Inlet 4- Harbor Porpoise	9	2	25	7	2	9	6	5	14	4
105	Cook Inlet 5- Harbor Porpoise	1	-	14	-	19	1	-	-	20	-
136	Kamishak Bay IBA	-	-	2	-	9	-	-	-	7	-
137	Kamishak Bay STEI Habitat	-	-	-	-	4	-	-	-	2	-
138	Tuxedni Is Colony IBA	12	3	-	-	-	-	7	-	-	-
139	Tuxedni Bay IBA	19	6	-	-	-	-	11	-	-	-
140	Redoubt Bay IBA	6	1	-	-	-	-	-	-	-	-
144	Clam Gulch STEI Habitat.	-	3	-	2	-	-	8	12	-	1
145	Outer Kachemak Bay/IBA	3	21	5	76	2	67	7	53	3	97

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Environmental Resource Area Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
146	Lower Cook Inlet 153W59N IBA	2	-	27	13	33	32	1	4	37	16
153	Polly Creek Beach	87	40	6	5	-	-	65	11	-	3
154	Chinitna Bay	6	-	14	1	-	-	2	1	3	-

Table A.2-2. 3 Days-(Annual ERA).

ID	Environmental Resource Area Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
0	Land	55	36	39	25	38	22	37	29	37	23
2	SUA: Tyonek North	1	-	-	-	-	-	-	-	-	-
3	SUA: Tyonek South	17	5	-	-	-	-	4	1	-	-
4	SUA: Seldovia, Port Graham, Nanwalek	1	1	3	9	2	21	1	3	2	14
11	Augustine	12	9	38	16	63	18	11	12	49	14
12	South Cook HS 1a	59	56	83	63	5	27	66	61	43	46
13	South Cook HS 1b	35	30	85	44	86	41	37	35	96	38
14	South Cook HS 1c	11	7	35	15	59	24	10	9	54	16
15	South Cook HS 1d	2	1	12	3	27	8	2	2	22	4
16	Inner Kachemak Bay	-	-	-	3	-	3	-	1	-	3
17	Clam Gulch HS	2	47	-	9	-	1	33	36	-	6
18	Tuxedni HS	35	24	-	2	-	-	31	8	-	2
19	Kalgin Island HS	16	14	-	-	-	-	6	3	-	-
20	Redoubt Bay HS	8	2	-	-	-	-	1	-	-	-
21	Trading Bay HS	1	-	-	-	-	-	-	-	-	-
23	Barren Isl. Pinn	-	-	2	1	3	5	-	-	3	3
24	Shelikof MM 2	-	-	-	-	3	-	-	-	2	-
37	Port Chatham Pinniped	-	-	-	-	-	1	-	-	-	1
45	Clam Gulch	1	15	-	8	-	2	19	39	-	6
46	Outer Kachemak Bay	4	11	5	44	2	46	6	28	4	37
47	SW Cook Inlet	61	37	38	19	10	9	50	24	17	15
48	Kamishak Bay	5	3	21	8	46	10	4	5	36	7
49	Katmai NP	-	-	-	-	1	-	-	-	1	-
68	Kenai Fjords-west	-	-	1	1	1	5	-	-	1	3
70	Forelands- Beluga CH	1	-	-	-	-	-	-	-	-	-
71	Middle Cook Inlet-Beluga CH	29	33	-	2	-	-	22	13	-	2
72	West Cook Inlet-Beluga CH	48	31	43	21	31	12	39	23	32	16
75	Kachemak- Humpback Whale	3	1	10	6	12	16	2	2	12	10
77	N Kodiak- Humpback Whale	-	-	-	-	1	-	-	-	1	-
80	Shelikof MM 1	1	-	5	1	13	3	-	1	11	2
81	Shelikof MM 1a	-	-	2	-	4	-	-	-	5	-
82	Shelikof MM 2a	-	-	-	-	1	-	-	-	1	-
90	Barren Islands- Fin Whale	2	1	9	4	17	13	1	2	14	8
94	Lower E Kenai- Gray Whale	-	-	1	1	1	4	-	-	1	2
95	NE Kodiak- Gray Whale	-	-	1	1	1	4	-	-	1	3
101	Cook Inlet 1- Harbor Porpoise	5	1	-	-	-	-	-	-	-	-
102	Cook Inlet 2- Harbor Porpoise	11	12	-	1	-	-	9	6	-	1
103	Cook Inlet 3- Harbor Porpoise	20	20	4	13	-	2	24	17	1	9
104	Cook Inlet 4- Harbor Porpoise	17	14	26	17	4	14	18	14	14	14
105	Cook Inlet 5- Harbor Porpoise	8	6	20	9	21	7	8	7	23	7
135	Shaw Is Colony	-	-	-	-	1	-	-	-	1	-
136	Kamishak Bay IBA	2	1	7	3	14	3	2	2	11	2
137	Kamishak Bay STEI Habitat	1	-	5	2	12	3	1	1	9	1
138	Tuxedni Is Colony IBA	12	6	-	-	-	-	9	2	-	-
139	Tuxedni Bay IBA	23	14	-	1	-	-	17	5	-	1
140	Redoubt Bay IBA	11	3	-	-	-	-	1	-	-	-
144	Clam Gulch STEI Habitat.	1	5	-	3	-	1	9	13	-	3
145	Outer Kachemak Bay/IBA	11	29	14	81	7	74	19	59	10	97
146	Lower Cook Inlet 153W59N IBA	10	11	31	26	34	38	11	17	38	28
147	Barren Islands Marine IBA	-	-	1	-	1	1	-	-	1	-
148	Barren Islands Colonies IBA	-	-	1	-	1	1	-	-	1	-

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Environmental Resource Area Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
153	Polly Creek Beach	88	58	7	12	-	1	78	28	1	9
154	Chinitna Bay	14	9	18	8	1	3	12	9	5	6
155	Barren Islands	-	-	2	1	3	4	-	-	3	2

Table A.2-3. 10 Days-(Annual ERA).

ID	Environmental Resource Area Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
0	Land	86	79	81	76	82	75	80	77	81	76
2	SUA: Tyonek North	1	-	-	-	-	-	-	-	-	-
3	SUA: Tyonek South	18	7	-	1	-	-	5	3	-	1
4	SUA: Seldovia, Port Graham, Nanwalek	5	6	9	17	6	29	7	9	7	21
5	SUA: Port Lions	4	4	8	6	11	8	4	5	10	6
6	SUA: Ouzinke	2	3	5	4	7	5	3	3	7	4
7	SUA: Larsen Bay	-	-	-	-	1	-	-	-	1	-
8	SUA: Karluk	-	-	1	-	1	1	-	-	1	1
11	Augustine	23	26	50	36	71	38	28	31	60	35
12	South Cook HS 1a	61	64	84	70	8	36	72	70	44	56
13	South Cook HS 1b	42	47	87	58	86	54	51	52	97	53
14	South Cook HS 1c	24	27	45	35	63	42	29	30	60	36
15	South Cook HS 1d	15	17	29	23	40	28	18	20	37	24
16	Inner Kachemak Bay	1	1	1	5	1	6	1	2	1	5
17	Clam Gulch HS	3	48	1	11	-	4	34	38	1	9
18	Tuxedni HS	36	27	1	5	-	1	34	12	-	4
19	Kalgin Island HS	17	15	-	2	-	-	8	5	-	1
20	Redoubt Bay HS	8	2	-	-	-	-	1	1	-	-
21	Trading Bay HS	1	-	-	-	-	-	-	-	-	-
23	Barren Isl. Pinn	5	5	9	8	10	12	6	6	10	9
24	Shelikof MM 2	6	7	13	10	17	13	7	8	16	11
25	Shelikof MM 3	2	2	5	4	7	5	3	3	7	4
26	Shelikof MM 4	1	1	2	1	3	2	1	1	3	2
27	Shelikof MM 5	-	-	1	-	1	1	-	-	1	-
28	Shelikof MM 6	-	-	-	-	1	-	-	-	1	-
31	Kodiak Pinniped 1	-	-	1	1	1	1	-	-	1	1
37	Port Chatham Pinniped	1	1	3	2	3	3	1	1	3	2
45	Clam Gulch	3	18	1	11	1	4	21	41	1	9
46	Outer Kachemak Bay	9	17	10	49	6	50	13	33	7	42
47	SW Cook Inlet	65	50	42	32	12	18	60	39	20	27
48	Kamishak Bay	17	20	37	28	58	31	21	24	50	28
49	Katmai NP	3	3	6	4	9	6	3	3	8	5
59	Kodiak NWR-south	-	-	-	-	1	-	-	-	1	-
60	Kodiak NWR-west	1	1	2	1	2	2	1	1	2	1
64	Afognak-west	2	2	4	3	6	4	2	2	5	3
67	Shuyak	2	2	4	3	5	4	2	2	5	3
68	Kenai Fjords-west	2	2	4	5	3	9	2	3	3	6
70	Forelands- Beluga CH	2	1	-	-	-	-	1	-	-	-
71	Middle Cook Inlet-Beluga CH	30	35	-	5	-	2	24	16	-	4
72	West Cook Inlet-Beluga CH	57	50	55	42	42	32	57	45	43	38
75	Kachemak- Humpback Whale	10	11	17	15	18	23	12	12	18	19
76	Shelikof- Humpback Whale	1	1	3	2	4	3	2	2	4	2
77	N Kodiak- Humpback Whale	3	3	7	5	9	6	4	4	9	5
78	E Kodiak- Humpback Whale	-	-	1	1	1	1	-	-	1	1
80	Shelikof MM 1	12	13	24	19	31	24	15	16	30	20
81	Shelikof MM 1a	4	3	7	4	9	4	4	4	9	3
82	Shelikof MM 2a	2	2	4	2	5	1	2	2	5	1
83	Shelikof MM 3a	1	-	2	1	2	-	1	1	2	-
84	Shelikof MM 4a	-	-	1	-	1	-	-	-	1	-
90	Barren Islands- Fin Whale	13	14	24	21	27	29	15	16	27	24
91	NE Kodiak- Fin Whale	1	1	2	1	3	2	1	1	3	2

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Environmental Resource Area Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
94	Lower E Kenai- Gray Whale	2	2	4	4	3	7	2	3	4	5
95	NE Kodiak- Gray Whale	3	3	5	5	5	8	3	3	5	6
98	Shelikof- Gray Whale	3	3	7	5	10	6	4	4	9	5
101	Cook Inlet 1- Harbor Porpoise	5	1	-	-	-	-	-	-	-	-
102	Cook Inlet 2- Harbor Porpoise	11	13	-	3	-	1	9	7	-	2
103	Cook Inlet 3- Harbor Porpoise	21	23	5	16	1	6	26	21	1	13
104	Cook Inlet 4- Harbor Porpoise	19	21	27	23	5	19	23	21	15	20
105	Cook Inlet 5- Harbor Porpoise	12	13	23	16	22	14	14	14	25	14
108	Shelikof- Killer Whale	4	4	8	6	11	8	4	5	10	6
109	E Kodiak- Killer Whale	-	-	1	-	1	1	-	-	1	1
111	NW Afognak Is IBA	-	-	1	-	1	-	-	-	1	-
134	Kiukpalik Is Colony	-	-	1	-	1	-	-	-	1	-
135	Shaw Is Colony	1	1	2	1	3	1	1	1	3	1
136	Kamishak Bay IBA	5	6	11	8	16	8	6	7	14	8
137	Kamishak Bay STEI Habitat	4	5	10	8	17	10	5	7	14	8
138	Tuxedni Is Colony IBA	13	8	-	1	-	-	10	4	-	1
139	Tuxedni Bay IBA	24	16	1	3	-	1	19	7	-	3
140	Redoubt Bay IBA	11	4	-	-	-	-	2	1	-	-
144	Clam Gulch STEI Habitat.	1	6	1	5	-	2	10	14	-	4
145	Outer Kachemak Bay/IBA	16	36	19	82	11	76	26	63	14	97
146	Lower Cook Inlet 153W59N IBA	14	17	32	31	34	40	18	24	38	32
147	Barren Islands Marine IBA	2	2	4	2	4	3	2	2	4	2
148	Barren Islands Colonies IBA	2	2	3	2	4	2	2	1	4	2
151	Gulf of AK Shelf 151W58N IBA	-	-	-	-	-	1	-	-	-	-
153	Polly Creek Beach	88	64	8	19	1	5	82	36	1	15
154	Chinitna Bay	17	14	20	13	1	6	17	15	6	11
155	Barren Islands	5	4	8	7	9	11	5	5	9	8

Table A.2-4. 30 Days-(Annual ERA).

ID	Environmental Resource Area Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
0	Land	97	96	96	95	95	95	97	96	96	95
2	SUA: Tyonek North	1	-	-	-	-	-	-	-	-	-
3	SUA: Tyonek South	18	8	-	1	-	-	5	3	-	1
4	SUA: Seldovia, Port Graham, Nanwalek	6	8	10	18	7	30	8	11	8	23
5	SUA: Port Lions	6	8	11	10	14	12	8	9	13	11
6	SUA: Ouzinke	4	5	7	7	9	8	5	6	9	7
7	SUA: Larsen Bay	1	1	1	1	1	1	1	1	1	1
8	SUA: Karluk	1	1	2	1	2	2	1	1	2	1
9	SUA: Akhiok	-	-	1	-	1	1	-	-	1	-
11	Augustine	25	29	52	39	72	41	31	34	62	38
12	South Cook HS 1a	61	65	84	71	8	37	72	71	44	56
13	South Cook HS 1b	42	48	87	60	86	56	52	54	97	55
14	South Cook HS 1c	25	29	46	38	64	44	31	32	60	39
15	South Cook HS 1d	17	20	31	27	41	32	22	23	39	27
16	Inner Kachemak Bay	1	1	1	5	1	6	1	2	1	5
17	Clam Gulch HS	4	48	1	12	1	4	34	38	1	9
18	Tuxedni HS	36	28	1	5	-	2	34	13	-	5
19	Kalgin Island HS	17	16	-	2	-	1	8	5	-	1
20	Redoubt Bay HS	8	2	-	-	-	-	1	1	-	-
21	Trading Bay HS	1	-	-	-	-	-	-	-	-	-
23	Barren Isl. Pinn	6	7	10	9	11	14	7	7	11	11
24	Shelikof MM 2	9	11	16	14	20	17	11	12	19	15
25	Shelikof MM 3	4	5	8	7	9	8	6	6	9	7
26	Shelikof MM 4	2	3	4	4	5	4	3	3	5	4
27	Shelikof MM 5	1	2	3	2	3	2	2	2	3	2
28	Shelikof MM 6	1	1	2	2	2	2	1	1	2	2
29	Shelikof MM 7	-	-	1	-	1	1	-	-	1	-

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Environmental Resource Area Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
30	Shelikof MM 8	1	1	1	1	2	1	1	1	1	1
31	Kodiak Pinniped 1	1	1	2	1	2	2	1	1	2	2
37	Port Chatham Pinniped	2	2	3	3	3	4	2	2	3	3
43	AK Peninsula Pinniped 1	1	1	1	1	1	1	1	1	1	1
45	Clam Gulch	3	18	1	12	1	4	22	41	1	10
46	Outer Kachemak Bay	9	18	11	49	6	50	14	34	8	42
47	SW Cook Inlet	66	51	43	33	13	20	61	40	21	29
48	Kamishak Bay	19	24	39	32	60	35	25	27	52	32
49	Katmai NP	5	5	9	7	11	9	6	6	11	8
50	Becharof NWR	-	-	1	1	1	1	-	-	1	1
51	Alaska Peninsula NWR North	-	-	1	-	1	-	-	-	1	-
59	Kodiak NWR-south	1	1	1	1	2	2	1	1	2	1
60	Kodiak NWR-west	2	2	3	3	4	3	2	3	4	3
64	Afognak-west	3	4	5	5	7	6	4	4	7	5
66	Afognak-east	-	-	-	-	1	1	-	-	1	-
67	Shuyak	3	3	5	4	6	5	3	3	6	4
68	Kenai Fjords-west	3	3	4	5	4	9	3	4	4	7
70	Forelands- Beluga CH	2	1	-	-	-	-	1	-	-	-
71	Middle Cook Inlet-Beluga CH	30	35	1	6	-	2	24	16	-	5
72	West Cook Inlet-Beluga CH	59	53	57	45	43	35	60	48	45	42
73	NPRW Feeding Area	-	-	1	-	1	1	-	-	1	-
75	Kachemak- Humpback Whale	11	12	18	17	18	25	13	14	19	20
76	Shelikof- Humpback Whale	3	3	5	4	6	5	4	4	6	5
77	N Kodiak- Humpback Whale	5	5	8	7	10	8	6	6	10	7
78	E Kodiak- Humpback Whale	1	1	2	1	2	2	1	1	2	1
80	Shelikof MM 1	15	18	27	24	33	28	19	20	32	25
81	Shelikof MM 1a	4	5	8	5	10	5	5	5	10	5
82	Shelikof MM 2a	3	3	5	3	6	3	3	3	6	3
83	Shelikof MM 3a	1	2	3	2	3	2	2	1	3	2
84	Shelikof MM 4a	1	1	1	1	2	1	1	1	2	1
85	Shelikof MM 5a	1	1	1	1	1	1	1	1	1	1
86	Shelikof MM 6a	-	-	1	-	1	-	1	-	1	-
89	Shelikof MM 11	-	-	1	1	1	1	-	-	1	1
90	Barren Islands- Fin Whale	14	16	25	23	27	31	17	19	27	26
91	NE Kodiak- Fin Whale	2	2	3	3	3	3	2	2	3	3
94	Lower E Kenai- Gray Whale	3	3	4	5	4	7	3	3	4	6
95	NE Kodiak- Gray Whale	4	4	6	6	6	9	4	5	6	7
97	SE Kodiak- Gray Whale	-	-	1	1	1	1	-	-	1	1
98	Shelikof- Gray Whale	6	7	10	8	13	10	7	7	12	9
99	N Shumagin- Gray Whale	-	-	1	1	1	1	-	-	1	1
101	Cook Inlet 1- Harbor Porpoise	5	1	-	-	-	-	-	-	-	-
102	Cook Inlet 2- Harbor Porpoise	11	13	-	3	-	1	9	7	-	3
103	Cook Inlet 3- Harbor Porpoise	21	24	5	17	1	6	26	22	2	14
104	Cook Inlet 4- Harbor Porpoise	19	21	27	24	6	20	23	22	16	21
105	Cook Inlet 5- Harbor Porpoise	12	14	23	17	23	16	15	15	25	16
108	Shelikof- Killer Whale	6	7	11	10	13	12	8	8	13	10
109	E Kodiak- Killer Whale	1	1	2	1	2	2	1	1	2	1
111	NW Afognak Is IBA	1	1	1	1	1	1	1	1	1	1
134	Kiukpalik Is Colony	1	1	1	1	1	1	1	1	2	1
135	Shaw Is Colony	2	2	3	2	3	2	2	2	3	2
136	Kamishak Bay IBA	6	7	11	9	17	10	7	8	15	9
137	Kamishak Bay STEI Habitat	5	6	10	9	17	10	6	8	14	9
138	Tuxedni Is Colony IBA	13	8	-	2	-	1	10	4	-	2
139	Tuxedni Bay IBA	24	16	1	3	-	1	19	8	-	3
140	Redoubt Bay IBA	11	4	-	-	-	-	2	1	-	-
144	Clam Gulch STEI Habitat.	1	6	1	5	-	2	10	14	-	4
145	Outer Kachemak Bay/IBA	17	37	19	83	11	76	27	63	14	97
146	Lower Cook Inlet 153W59N IBA	14	18	32	31	34	40	18	24	38	32

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Environmental Resource Area Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
147	Barren Islands Marine IBA	3	3	4	3	5	4	3	3	5	3
148	Barren Islands Colonies IBA	2	2	4	3	4	4	3	2	5	3
151	Gulf of AK Shelf 151W58N IBA	1	-	1	1	1	1	1	1	1	1
153	Polly Creek Beach	89	65	8	19	1	6	83	37	2	16
154	Chinitna Bay	17	15	20	14	1	7	18	15	6	12
155	Barren Islands	5	6	9	9	10	12	6	7	10	10

Table A.2-5. 110 Days-(Annual ERA).

ID	Environmental Resource Area Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
0	Land	98	97	96	96	96	95	97	96	96	96
2	SUA: Tyonek North	1	-	-	-	-	-	-	-	-	-
3	SUA: Tyonek South	18	8	-	1	-	-	5	3	-	1
4	SUA: Seldovia, Port Graham, Nanwalek	6	8	10	18	7	30	8	11	8	23
5	SUA: Port Lions	6	8	11	10	14	12	8	9	13	11
6	SUA: Ouzinke	4	5	7	7	9	8	5	6	9	7
7	SUA: Larsen Bay	1	1	1	1	1	1	1	1	1	1
8	SUA: Karluk	1	1	2	2	2	2	1	1	2	2
9	SUA: Akhiok	-	-	1	-	1	1	-	-	1	1
11	Augustine	25	29	52	39	72	41	31	34	62	39
12	South Cook HS 1a	61	65	84	71	8	37	72	71	44	56
13	South Cook HS 1b	42	48	87	60	86	56	52	54	97	55
14	South Cook HS 1c	25	29	46	38	64	44	31	32	60	39
15	South Cook HS 1d	17	20	31	27	41	32	22	23	39	27
16	Inner Kachemak Bay	1	1	1	5	1	6	1	2	1	5
17	Clam Gulch HS	4	48	1	12	1	4	34	38	1	9
18	Tuxedni HS	36	28	1	5	-	2	34	13	-	5
19	Kalgin Island HS	17	16	-	2	-	1	8	5	-	1
20	Redoubt Bay HS	8	2	-	-	-	-	1	1	-	-
21	Trading Bay HS	1	-	-	-	-	-	-	-	-	-
23	Barren Isl. Pinn	6	7	10	9	11	14	7	7	11	11
24	Shelikof MM 2	9	11	16	14	20	17	11	12	19	15
25	Shelikof MM 3	4	5	8	7	9	8	6	6	9	7
26	Shelikof MM 4	2	3	4	4	5	4	3	3	5	4
27	Shelikof MM 5	1	2	3	2	3	2	2	2	3	2
28	Shelikof MM 6	1	1	2	2	2	2	1	1	2	2
29	Shelikof MM 7	-	-	1	-	1	1	-	-	1	-
30	Shelikof MM 8	1	1	1	1	2	1	1	1	2	1
31	Kodiak Pinniped 1	1	1	2	1	2	2	1	1	2	2
37	Port Chatham Pinniped	2	2	3	3	3	4	2	2	3	3
43	AK Peninsula Pinniped 1	1	1	1	1	1	1	1	1	1	1
45	Clam Gulch	3	18	1	12	1	4	22	41	1	10
46	Outer Kachemak Bay	9	18	11	49	6	50	14	34	8	42
47	SW Cook Inlet	66	51	43	33	13	20	61	40	21	29
48	Kamishak Bay	19	24	39	32	60	35	25	27	52	32
49	Katmai NP	5	5	9	7	11	9	6	7	11	8
50	Becharof NWR	-	-	1	1	1	1	-	-	1	1
51	Alaska Peninsula NWR North	-	-	1	-	1	1	-	-	1	-
59	Kodiak NWR-south	1	1	2	1	2	2	1	1	2	1
60	Kodiak NWR-west	2	2	3	3	4	3	2	3	4	3
64	Afognak-west	3	4	5	5	7	6	4	4	7	5
66	Afognak-east	-	-	1	-	1	1	-	-	1	-
67	Shuyak	3	3	5	4	6	5	3	3	6	4
68	Kenai Fjords-west	3	3	4	5	4	9	3	4	4	7
70	Forelands- Beluga CH	2	1	-	-	-	-	1	-	-	-
71	Middle Cook Inlet-Beluga CH	30	35	1	6	-	2	24	16	-	5
72	West Cook Inlet-Beluga CH	59	53	57	45	43	35	60	48	45	42
73	NPRW Feeding Area	-	-	1	-	1	1	-	-	1	-

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Environmental Resource Area Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
75	Kachemak- Humpback Whale	11	12	18	17	18	25	13	14	19	20
76	Shelikof- Humpback Whale	3	3	5	4	6	5	4	4	6	5
77	N Kodiak- Humpback Whale	5	5	8	7	10	8	6	6	10	7
78	E Kodiak- Humpback Whale	1	1	2	1	2	2	1	1	2	1
80	Shelikof MM 1	15	18	27	24	33	28	19	20	32	25
81	Shelikof MM 1a	4	5	8	5	10	5	5	5	10	5
82	Shelikof MM 2a	3	3	5	3	6	3	3	3	6	3
83	Shelikof MM 3a	1	2	3	2	3	2	2	2	3	2
84	Shelikof MM 4a	1	1	1	1	2	1	1	1	2	1
85	Shelikof MM 5a	1	1	1	1	1	1	1	1	1	1
86	Shelikof MM 6a	-	-	1	-	1	-	1	-	1	-
89	Shelikof MM 11	-	-	1	1	1	1	-	1	1	1
90	Barren Islands- Fin Whale	14	17	25	23	28	31	17	19	27	26
91	NE Kodiak- Fin Whale	2	2	3	3	3	3	2	2	3	3
94	Lower E Kenai- Gray Whale	3	3	4	5	4	8	3	4	4	6
95	NE Kodiak- Gray Whale	4	4	6	6	6	9	4	5	6	7
97	SE Kodiak- Gray Whale	-	-	1	1	1	1	-	-	1	1
98	Shelikof- Gray Whale	6	7	10	9	13	10	7	8	12	9
99	N Shumagin- Gray Whale	-	-	1	1	1	1	1	1	1	1
101	Cook Inlet 1- Harbor Porpoise	5	1	-	-	-	-	-	-	-	-
102	Cook Inlet 2- Harbor Porpoise	11	13	-	3	-	1	9	7	-	3
103	Cook Inlet 3- Harbor Porpoise	21	24	5	17	1	7	26	22	2	14
104	Cook Inlet 4- Harbor Porpoise	19	21	27	24	6	20	23	22	16	21
105	Cook Inlet 5- Harbor Porpoise	12	14	23	17	23	16	15	15	25	16
108	Shelikof- Killer Whale	6	8	11	10	13	12	8	8	13	10
109	E Kodiak- Killer Whale	1	1	2	1	2	2	1	1	2	1
111	NW Afognak Is IBA	1	1	1	1	1	1	1	1	1	1
134	Kiukpalik Is Colony	1	1	1	1	2	1	1	1	2	1
135	Shaw Is Colony	2	2	3	2	3	2	2	2	3	2
136	Kamishak Bay IBA	6	7	11	9	17	10	7	8	15	9
137	Kamishak Bay STEI Habitat	5	6	10	9	17	10	6	8	14	9
138	Tuxedni Is Colony IBA	13	8	-	2	-	1	10	4	-	2
139	Tuxedni Bay IBA	24	16	1	3	-	1	19	8	-	3
140	Redoubt Bay IBA	11	4	-	-	-	-	2	1	-	-
144	Clam Gulch STEI Habitat.	1	6	1	5	-	2	10	14	-	4
145	Outer Kachemak Bay/IBA	17	37	19	83	11	76	27	63	14	97
146	Lower Cook Inlet 153W59N IBA	14	18	32	31	34	40	18	24	38	32
147	Barren Islands Marine IBA	3	3	4	3	5	4	3	3	5	3
148	Barren Islands Colonies IBA	2	2	4	3	5	4	3	2	5	3
151	Gulf of AK Shelf 151W58N IBA	1	1	1	1	1	1	1	1	1	1
153	Polly Creek Beach	89	65	8	19	1	6	83	37	2	16
154	Chinitna Bay	17	15	20	14	1	7	18	15	6	12
155	Barren Islands	6	6	9	9	10	12	7	7	10	10

Tables A.2-6 through A.2-10 represent annual conditional probabilities (expressed as percent chance) that a large oil spill starting at a particular location will contact a certain land segment (LS) within:

Table A.2-6. 1 Days-(Annual LS).

ID	Land Segment Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
29	Augustine Island	-	-	-	-	4	-	-	-	3	-
30	Rocky Cove, Tignagvik Point	-	-	-	-	1	-	-	-	-	-
31	Iiamna Bay, Iniskin Bay, Ursus Cove	-	-	-	-	3	-	-	-	1	-
32	Chinitna Point, Dry Bay	-	-	4	-	3	-	-	-	3	-
33	Chinitna Bay	2	-	9	-	-	-	1	-	2	-
34	Iliamna Point	3	-	-	-	-	-	2	-	-	-
35	Chisik Island, Tuxedni Bay	9	2	-	-	-	-	4	-	-	-

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Land Segment Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
36	Redoubt Point	8	1	-	-	-	-	1	-	-	-
37	Drift River, Drift River Terminal	1	-	-	-	-	-	-	-	-	-
38	Kalgin Island	1	2	-	-	-	-	-	-	-	-
55	Deep Creek, Ninilchik, Ninilchik River	-	-	-	-	-	-	1	-	-	-
56	Cape Starichkof, Happy Valley	-	1	-	1	-	-	-	5	-	-
61	Barabara Point, Seldovia Bay	-	-	-	-	-	1	-	-	-	-
62	Nanwalek, Port Graham	-	-	-	-	-	1	-	-	-	1

Table A.2-7. 3 Days-(Annual LS).

ID	Land Segment Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
25	Spotted Glacier, Sukoi Bay	-	-	-	-	1	-	-	-	1	-
26	Douglas River	-	-	-	-	1	-	-	-	1	-
28	Amakdedulia Cove, Bruin Bay, Chenik Head	-	-	-	-	1	-	-	-	1	-
29	Augustine Island	1	-	5	1	11	2	1	1	9	1
30	Rocky Cove, Tignagvik Point	-	-	3	1	7	1	-	-	5	-
31	Iiamna Bay, Iniskin Bay, Ursus Cove	1	-	4	1	10	2	1	1	7	1
32	Chinitna Point, Dry Bay	3	2	10	3	6	3	2	3	7	3
33	Chinitna Bay	10	6	15	7	1	2	9	7	5	5
34	Iliamna Point	5	4	1	1	-	-	5	2	-	1
35	Chisik Island, Tuxedni Bay	14	9	-	1	-	-	10	3	-	1
36	Redoubt Point	14	5	-	-	-	-	3	1	-	-
37	Drift River, Drift River Terminal	3	1	-	-	-	-	-	-	-	-
38	Kalgin Island	2	3	-	-	-	-	-	-	-	-
40	Kustatan River,West Foreland	1	-	-	-	-	-	-	-	-	-
54	Clam Gulch, Kasilof	-	1	-	-	-	-	2	1	-	-
55	Deep Creek, Ninilchik, Ninilchik River	-	1	-	-	-	-	2	1	-	-
56	Cape Starichkof, Happy Valley	-	3	-	3	-	-	1	7	-	2
57	Anchor Point, Anchor River	-	-	-	1	-	1	-	1	-	1
60	China Poot Bay, Gull Island	-	-	-	-	-	1	-	-	-	-
61	Barabara Point, Seldovia Bay	-	-	-	2	-	3	-	1	-	2
62	Nanwalek, Port Graham	-	-	1	1	-	5	-	-	-	3
63	Elizabeth Island, Port Chatham, Koyuktolik Bay	-	-	-	-	-	1	-	-	-	-

Table A.2-8. 10 Days-(Annual LS).

ID	Land Segment Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
21	Kaflia, Kukak, Kuliak & Missak Bays	-	-	1	-	1	1	-	-	1	1
22	Devils Cove, Hallo Bay	-	-	1	1	1	1	-	1	1	1
23	Cape Chiniak, Swikshak Bay	-	-	1	1	1	1	-	-	1	1
24	Fourpeaked Glacier	1	1	2	1	2	1	1	1	2	1
25	Spotted Glacier, Sukoi Bay	2	2	3	2	4	3	2	2	4	2
26	Douglas River	1	1	2	2	4	2	2	2	3	2
27	Akumwarvik Bay, McNeil Cove, Nordyke Island	-	-	1	-	1	1	-	-	1	-
28	Amakdedulia Cove, Bruin Bay, Chenik Head	1	1	3	2	5	3	1	2	4	2
29	Augustine Island	4	4	8	6	14	6	5	5	13	6
30	Rocky Cove, Tignagvik Point	3	3	6	4	10	5	3	4	8	4
31	Iiamna Bay, Iniskin Bay, Ursus Cove	3	3	7	5	12	6	4	4	9	5
32	Chinitna Point, Dry Bay	5	5	11	7	7	6	5	6	8	7
33	Chinitna Bay	13	12	17	12	1	6	14	13	6	10
34	Iliamna Point	6	5	1	2	-	1	7	4	-	2
35	Chisik Island, Tuxedni Bay	15	11	-	2	-	1	12	5	-	2
36	Redoubt Point	15	6	-	1	-	-	4	2	-	1
37	Drift River, Drift River Terminal	3	1	-	-	-	-	1	1	-	-
38	Kalgin Island	3	3	-	-	-	-	1	-	-	-
40	Kustatan River,West Foreland	1	-	-	-	-	-	-	-	-	-
54	Clam Gulch, Kasilof	-	2	-	1	-	-	3	2	-	1
55	Deep Creek, Ninilchik, Ninilchik River	-	2	-	1	-	-	2	2	-	1

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Land Segment Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
56	Cape Starichkof, Happy Valley	1	4	-	4	-	1	2	8	-	3
57	Anchor Point, Anchor River	-	1	-	2	-	2	1	1	-	2
58	Homer, Homer Spit	-	-	-	1	-	1	-	-	-	1
60	China Poot Bay, Gull Island	-	-	-	1	-	1	-	-	-	1
61	Barabara Point, Seldovia Bay	1	1	1	4	1	5	1	2	1	4
62	Nanwalek, Port Graham	1	1	2	4	2	7	1	2	2	5
63	Elizabeth Island, Port Chatham, Koyuktolik Bay	-	-	1	1	1	2	-	1	1	1
79	Barren Islands, Ushagat Island	1	1	2	1	2	2	1	1	2	1
80	Amatuli Cove, East & West Amatuli Island	-	-	1	1	1	1	-	-	1	1
81	Shuyak Island	1	1	1	1	2	2	1	1	2	1
82	Bluefox Bay, Shuyak Island, Shuyak Strait	1	1	2	1	3	2	1	1	2	1
83	Foul Bay, Paramanof Bay	1	1	2	1	3	2	1	1	3	2
84	Malina Bay, Raspberry Island, Raspberry Strait	-	1	1	1	1	1	1	1	1	1
85	Kupreanof Strait, Viekoda Bay	-	-	-	-	1	1	-	-	1	-
86	Uganik Bay Uganik Strait, Cape Ugat	-	-	1	-	1	1	-	-	1	1

Table A.2-9. 30 Days-(Annual LS).

ID	Land Segment Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
20	Amalik, Dakavak & Kinak Bays, Cape Iiktugitak, Takli Is.	-	-	-	-	1	-	-	-	-	-
21	Kaflia, Kukak, Kuliak & Missak Bays	1	1	1	1	1	1	1	1	1	1
22	Devils Cove, Hallo Bay	1	1	1	1	2	2	1	1	2	1
23	Cape Chiniak, Swikshak Bay	1	1	1	1	2	1	1	1	2	1
24	Fourpeaked Glacier	1	1	2	2	3	2	1	1	3	2
25	Spotted Glacier, Sukoi Bay	2	2	4	3	4	4	3	3	4	3
26	Douglas River	2	2	3	2	4	3	2	2	4	2
27	Akumwarvik Bay, McNeil Cove, Nordyke Island	-	-	1	1	1	1	1	1	1	1
28	Amakdedulia Cove, Bruin Bay, Chenik Head	2	2	4	3	6	4	2	2	5	3
29	Augustine Island	4	5	9	7	14	7	6	6	13	7
30	Rocky Cove, Tignagvik Point	3	4	7	5	10	6	4	4	9	5
31	Iiamna Bay, Iniskin Bay, Ursus Cove	3	4	8	6	12	6	5	5	10	6
32	Chinitna Point, Dry Bay	5	6	12	8	7	7	6	7	9	7
33	Chinitna Bay	13	12	17	13	1	6	15	13	6	11
34	Iliamna Point	6	5	1	2	-	1	7	4	-	2
35	Chisik Island, Tuxedni Bay	15	11	-	2	-	1	12	5	-	2
36	Redoubt Point	15	6	-	1	-	-	4	3	-	1
37	Drift River, Drift River Terminal	3	2	-	-	-	-	1	1	-	-
38	Kalgin Island	3	3	-	-	-	-	1	-	-	-
40	Kustatan River,West Foreland	1	-	-	-	-	-	-	-	-	-
54	Clam Gulch, Kasilof	-	3	-	1	-	-	3	2	-	1
55	Deep Creek, Ninilchik, Ninilchik River	-	2	-	1	-	-	2	2	-	1
56	Cape Starichkof, Happy Valley	1	4	1	4	-	2	2	8	-	3
57	Anchor Point, Anchor River	-	1	1	2	-	2	1	1	-	2
58	Homer, Homer Spit	-	-	-	1	-	2	-	-	-	1
60	China Poot Bay, Gull Island	-	-	-	1	-	1	-	-	-	1
61	Barabara Point, Seldovia Bay	1	1	1	4	1	5	1	2	1	4
62	Nanwalek, Port Graham	2	2	3	4	2	8	2	2	2	6
63	Elizabeth Island, Port Chatham, Koyuktolik Bay	1	1	1	1	1	2	1	1	1	2
79	Barren Islands, Ushagat Island	1	1	2	2	2	2	1	1	2	2
80	Amatuli Cove, East & West Amatuli Island	1	1	1	1	1	1	1	1	1	1
81	Shuyak Island	1	1	2	2	2	2	1	1	2	2
82	Bluefox Bay, Shuyak Island, Shuyak Strait	1	2	2	2	3	3	2	2	3	2
83	Foul Bay, Paramanof Bay	2	2	3	2	4	3	2	2	3	3
84	Malina Bay, Raspberry Island, Raspberry Strait	1	1	2	1	2	2	1	1	2	2
85	Kupreanof Strait, Viekoda Bay	1	1	1	1	1	1	1	1	1	1
86	Uganik Bay Uganik Strait, Cape Ugat	1	1	1	1	1	1	1	1	1	1
87	Cape Kuliuk, Spiridon Bay, Uyak Bay	-	-	1	1	1	1	-	-	1	1
88	Karluk Lagoon, Northeast Harbor, Karluk	-	-	1	-	1	1	-	-	1	1

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

Table A.2-10. 110 Days-(Annual LS).

ID	Land Segment Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
20	Amalik, Dakavak & Kinak Bays, Cape Iiktugitak, Takli Is.	-	-	-	-	1	-	-	-	1	-
21	Kaflia, Kukak, Kuliak & Missak Bays	1	1	1	1	1	1	1	1	1	1
22	Devils Cove, Hallo Bay	1	1	1	1	2	2	1	1	2	1
23	Cape Chiniak, Swikshak Bay	1	1	1	1	2	1	1	1	2	1
24	Fourpeaked Glacier	1	1	2	2	3	2	1	1	3	2
25	Spotted Glacier, Sukoi Bay	2	2	4	3	5	4	3	3	4	3
26	Douglas River	2	2	3	2	4	3	2	2	4	2
27	Akumwarvik Bay, McNeil Cove, Nordyke Island	-	1	1	1	1	1	1	1	1	1
28	Amakdedulia Cove, Bruin Bay, Chenik Head	2	2	4	3	6	4	2	2	5	3
29	Augustine Island	4	5	9	7	14	7	6	6	13	7
30	Rocky Cove, Tignagvik Point	3	4	7	5	10	6	4	4	9	5
31	Iiamna Bay, Iniskin Bay, Ursus Cove	3	4	8	6	12	6	5	5	10	6
32	Chinitna Point, Dry Bay	5	6	12	8	7	7	6	7	9	7
33	Chinitna Bay	13	12	17	13	1	6	15	13	6	11
34	Iliamna Point	6	5	1	2	-	1	7	4	-	2
35	Chisik Island, Tuxedni Bay	15	11	-	2	-	1	12	5	-	2
36	Redoubt Point	15	6	-	1	-	-	4	3	-	1
37	Drift River, Drift River Terminal	3	2	-	-	-	-	1	1	-	-
38	Kalgin Island	3	3	-	-	-	-	1	-	-	-
40	Kustatan River,West Foreland	1	-	-	-	-	-	-	-	-	-
54	Clam Gulch, Kasilof	-	3	-	1	-	-	3	2	-	1
55	Deep Creek, Ninilchik, Ninilchik River	-	2	-	1	-	-	2	2	-	1
56	Cape Starichkof, Happy Valley	1	4	1	4	-	2	2	8	-	3
57	Anchor Point, Anchor River	-	1	1	2	-	2	1	1	-	2
58	Homer, Homer Spit	-	-	-	1	-	2	-	-	-	1
60	China Poot Bay, Gull Island	-	-	-	1	-	1	-	-	-	1
61	Barabara Point, Seldovia Bay	1	1	1	4	1	5	1	2	1	4
62	Nanwalek, Port Graham	2	2	3	4	2	8	2	3	2	6
63	Elizabeth Island, Port Chatham, Koyuktolik Bay	1	1	1	1	1	2	1	1	1	2
79	Barren Islands, Ushagat Island	1	1	2	2	2	2	1	1	2	2
80	Amatuli Cove, East & West Amatuli Island	1	1	1	1	1	1	1	1	1	1
81	Shuyak Island	1	1	2	2	2	2	1	1	2	2
82	Bluefox Bay, Shuyak Island, Shuyak Strait	1	2	2	2	3	3	2	2	3	2
83	Foul Bay, Paramanof Bay	2	2	3	2	4	3	2	2	3	3
84	Malina Bay, Raspberry Island, Raspberry Strait	1	1	2	1	2	2	1	1	2	2
85	Kupreanof Strait, Viekoda Bay	1	1	1	1	1	1	1	1	1	1
86	Uganik Bay Uganik Strait, Cape Ugat	1	1	1	1	1	1	1	1	1	1
87	Cape Kuliuk, Spiridon Bay, Uyak Bay	-	-	1	1	1	1	-	-	1	1
88	Karluk Lagoon, Northeast Harbor, Karluk	-	-	1	-	1	1	-	-	1	1

Tables A.2-11 through A.2-15 represent annual conditional probabilities (expressed as percent chance) that a large oil spill starting at a particular location will contact a group of land segments (GLS) within:

Table A.2-11. 1 Days-(Annual GLS).

ID	Grouped Land Segments Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
127	AMNWR W Cook Inlet	19	3	13	-	10	-	6	-	9	-
128	Lake Clark National Park and Preserve	22	3	9	-	-	-	8	-	2	-
129	Redoubt Bay Brown Bears	2	2	-	-	-	-	-	-	-	-
135	Kenai AK State Rec Mgmt Areas	-	2	-	1	-	1	2	6	-	1
136	West Kenai Brown Bears	-	1	-	1	-	-	1	3	-	-
137	West Kenai Moose	-	-	-	-	-	-	1	-	-	-
138	Clam Gulch Critical Habitat	-	2	-	1	-	-	2	5	-	-
140	West Kenai Black Bears	-	-	-	-	-	1	-	-	-	-
141	Seldovia side Kachemak Bay	-	-	-	-	-	2	-	-	-	1
142	AMNWR E Cook Inlet	-	-	-	-	-	2	-	-	-	1

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

Table A.2-12. 3 Days-(Annual GLS).

ID	Grouped Land Segments Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
123	Katmai National Park	-	-	1	-	2	-	-	-	2	-
126	McNeil River State Game Sanctuary and Refuge	-	-	-	-	1	-	-	-	1	-
127	AMNWR W Cook Inlet	42	22	34	14	28	9	25	15	29	11
128	Lake Clark National Park and Preserve	43	23	16	9	1	2	27	13	5	7
129	Redoubt Bay Brown Bears	4	2	-	-	-	-	-	-	-	-
130	Redoubt Bay Critical Habitat Area	1	-	-	-	-	-	-	-	-	-
135	Kenai AK State Rec Mgmt Areas	1	6	-	7	-	5	5	11	-	6
136	West Kenai Brown Bears	-	3	-	3	-	1	3	6	-	2
137	West Kenai Moose	-	2	-	-	-	-	2	1	-	-
138	Clam Gulch Critical Habitat	1	5	-	3	-	-	5	10	-	2
139	Kachemak Bay State Park and Wilderness Park	-	-	-	-	-	1	-	-	-	-
140	West Kenai Black Bears	-	-	-	2	-	4	-	-	-	3
141	Seldovia side Kachemak Bay	-	-	1	4	-	8	-	1	1	6
142	AMNWR E Cook Inlet	-	-	1	4	-	8	-	1	1	6
143	AMNWR W Outer Kenai/GOA	-	-	-	-	-	1	-	-	-	-
152	Barren Islands	-	-	-	-	-	1	-	-	-	-

Table A.2-13. 10 Days-(Annual GLS).

ID	Grouped Land Segments Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
123	Katmai National Park	5	5	11	8	15	10	6	6	14	8
124	Kukak Bay	1	1	2	1	2	2	1	1	2	1
125	Spring Bear Concentration-1	-	-	-	-	1	1	-	-	1	-
126	McNeil River State Game Sanctuary and Refuge	2	2	4	3	6	3	2	2	5	3
127	AMNWR W Cook Inlet	56	44	48	36	39	28	46	38	41	33
128	Lake Clark National Park and Preserve	49	34	18	17	1	7	37	24	6	14
129	Redoubt Bay Brown Bears	5	3	-	-	-	-	1	1	-	-
130	Redoubt Bay Critical Habitat Area	1	1	-	-	-	-	-	-	-	-
135	Kenai AK State Rec Mgmt Areas	3	10	3	14	1	12	10	16	2	13
136	West Kenai Brown Bears	1	5	1	6	1	4	4	9	1	5
137	West Kenai Moose	-	2	-	1	-	-	3	2	-	1
138	Clam Gulch Critical Habitat	1	8	1	6	-	2	7	13	-	5
139	Kachemak Bay State Park and Wilderness Park	-	-	-	1	-	1	-	-	-	1
140	West Kenai Black Bears	1	1	2	4	2	7	1	2	2	5
141	Seldovia side Kachemak Bay	2	3	4	9	2	13	3	4	3	10
142	AMNWR E Cook Inlet	2	3	4	8	2	13	3	4	3	10
143	AMNWR W Outer Kenai/GOA	1	-	1	1	1	2	1	1	1	1
152	Barren Islands	1	1	2	2	3	3	1	1	3	2
153	Shuyak Island State Park	2	1	3	2	5	4	2	2	4	3
154	AMNWR Afognak and Shuyak Islands	3	3	6	5	9	7	3	3	9	5
155	Afognak & Raspberry Winter Elk	1	1	2	2	3	4	1	2	3	3
156	Kodiak National Wildlife Refuge	4	4	8	6	11	8	4	4	10	7
157	Afognak Blacktail Deer	1	1	2	2	3	3	1	1	3	2
158	AMNWR W Kodiak/Shelikof	1	1	1	1	2	2	1	1	2	1
159	Kupreanof Strait	-	-	-	-	1	1	-	-	1	-

Table A.2-14. 30 Days-(Annual GLS).

ID	Grouped Land Segments Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
113	Alaska Peninsula National Wildlife Refuge	-	-	-	-	-	-	-	-	1	-
114	AMNWR SW Shelikof/GOA	-	1	1	1	1	1	1	1	1	1
116	SUA: Chignik Chignik Lagoon	-	-	1	-	1	-	-	-	1	-
122	Becharof National Wildlife Refuge	-	-	1	1	1	1	-	-	1	1
123	Katmai National Park	7	9	14	12	18	14	9	10	17	12
124	Kukak Bay	1	2	3	2	3	3	2	2	3	3
125	Spring Bear Concentration-1	-	-	1	1	1	1	-	-	1	1
126	McNeil River State Game Sanctuary and Refuge	2	3	4	4	7	5	2	3	6	4
127	AMNWR W Cook Inlet	58	48	50	40	41	32	49	42	43	37

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Grouped Land Segments Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
128	Lake Clark National Park and Preserve	49	35	18	18	2	8	38	25	7	15
129	Redoubt Bay Brown Bears	5	3	-	-	-	-	1	1	-	-
130	Redoubt Bay Critical Habitat Area	1	1	-	-	-	-	-	-	-	-
135	Kenai AK State Rec Mgmt Areas	4	11	3	15	2	12	10	17	2	14
136	West Kenai Brown Bears	1	6	1	6	1	4	5	9	1	6
137	West Kenai Moose	-	2	-	1	-	-	3	2	-	1
138	Clam Gulch Critical Habitat	2	8	1	6	-	2	8	13	1	5
139	Kachemak Bay State Park and Wilderness Park	-	-	1	1	-	2	1	1	1	1
140	West Kenai Black Bears	2	2	2	4	2	8	2	2	2	6
141	Seldovia side Kachemak Bay	3	3	4	9	3	14	4	5	3	11
142	AMNWR E Cook Inlet	3	3	4	9	3	14	4	5	3	11
143	AMNWR W Outer Kenai/GOA	1	1	2	1	1	2	1	1	2	2
152	Barren Islands	2	2	3	3	3	4	2	2	3	3
153	Shuyak Island State Park	3	3	4	4	6	5	3	3	5	4
154	AMNWR Afognak and Shuyak Islands	5	6	9	8	12	11	7	7	11	9
155	Afognak & Raspberry Winter Elk	2	2	3	4	4	5	2	3	4	4
156	Kodiak National Wildlife Refuge	7	9	13	12	16	15	9	10	15	13
157	Afognak Blacktail Deer	1	2	3	3	3	4	2	2	3	3
158	AMNWR W Kodiak/Shelikof	2	2	3	3	4	4	2	3	4	3
159	Kupreanof Strait	1	1	1	1	1	1	1	1	1	1
161	AMNWR E Kodiak/GOA	-	-	-	-	1	1	-	-	1	-
164	Afognak Island State Park	-	-	1	-	1	1	-	-	1	1

Table A.2-15. 110 Days-(Annual GLS).

ID	Grouped Land Segments Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
113	Alaska Peninsula National Wildlife Refuge	-	-	1	-	1	-	-	-	1	-
114	AMNWR SW Shelikof/GOA	1	1	1	1	1	1	1	1	1	1
116	SUA: Chignik Chignik Lagoon	-	-	1	-	1	-	-	-	1	-
122	Becharof National Wildlife Refuge	-	-	1	1	1	1	-	-	1	1
123	Katmai National Park	8	9	14	12	18	14	10	10	17	12
124	Kukak Bay	1	2	3	2	3	3	2	2	3	3
125	Spring Bear Concentration-1	-	-	1	1	1	1	-	-	1	1
126	McNeil River State Game Sanctuary and Refuge	2	3	4	4	7	5	2	3	6	4
127	AMNWR W Cook Inlet	58	48	50	40	41	32	49	42	43	37
128	Lake Clark National Park and Preserve	49	35	18	18	2	8	38	25	7	15
129	Redoubt Bay Brown Bears	5	3	-	-	-	-	1	1	-	-
130	Redoubt Bay Critical Habitat Area	1	1	-	-	-	-	-	-	-	-
135	Kenai AK State Rec Mgmt Areas	4	11	3	15	2	12	10	17	2	14
136	West Kenai Brown Bears	1	6	1	6	1	4	5	9	1	6
137	West Kenai Moose	-	2	-	1	-	-	3	2	-	1
138	Clam Gulch Critical Habitat	2	8	1	6	-	2	8	13	1	5
139	Kachemak Bay State Park and Wilderness Park	-	-	1	1	1	2	1	1	1	1
140	West Kenai Black Bears	2	2	2	4	2	8	2	2	2	6
141	Seldovia side Kachemak Bay	3	3	4	9	3	14	4	5	3	11
142	AMNWR E Cook Inlet	3	3	4	9	3	14	4	5	3	11
143	AMNWR W Outer Kenai/GOA	1	1	2	2	2	2	1	1	2	2
152	Barren Islands	2	2	3	3	3	4	2	2	3	3
153	Shuyak Island State Park	3	3	4	4	6	5	3	3	5	4
154	AMNWR Afognak and Shuyak Islands	5	6	9	9	12	11	7	7	11	9
155	Afognak & Raspberry Winter Elk	2	2	3	4	4	5	2	3	4	4
156	Kodiak National Wildlife Refuge	8	9	13	12	16	15	10	10	16	13
157	Afognak Blacktail Deer	1	2	3	3	3	4	2	2	3	3
158	AMNWR W Kodiak/Shelikof	2	2	3	3	4	4	2	3	4	3
159	Kupreanof Strait	1	1	1	1	1	1	1	1	1	1
161	AMNWR E Kodiak/GOA	-	-	1	1	1	1	-	-	1	1
164	Afognak Island State Park	-	-	1	1	1	1	-	-	1	1

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

Tables A.2-16 through A.2-20 represent annual conditional probabilities (expressed as percent chance) that a large oil spill starting at a particular location will contact a certain boundary segment (BS) within:

Table A.2-16. 1 Days-(Annual BS).

ID	Boundary Segment Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4

Note: All rows have all values less than 0.5% and are not shown.

Table A.2-17. 3 Days-(Annual BS).

ID	Boundary Segment Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4

Note: All rows have all values less than 0.5% and are not shown.

Table A.2-18. 10 Days-(Annual BS).

ID	Boundary Segment Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4

Note: All rows have all values less than 0.5% and are not shown.

Table A.2-19. 30 Days-(Annual BS).

ID	Boundary Segment Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4

Note: All rows have all values less than 0.5% and are not shown.

Table A.2-20. 110 Days-(Annual BS).

ID	Boundary Segment Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
4	Gulf of Alaska	-	-	1	1	1	1	-	-	1	1

Tables A.2-21 through A.2-25 represent summer conditional probabilities (expressed as percent chance) that a large oil spill starting at a particular location will contact a certain environmental resource area within:

Table A.2-21. 1 Days-(Summer ERA).

ID	Environmental Resource Area Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
0	Land	20	7	11	2	7	2	8	7	6	1
2	SUA: Tyonek North	1	-	-	-	-	-	-	-	-	-
3	SUA: Tyonek South	20	2	-	-	-	-	2	-	-	-
4	SUA: Seldovia, Port Graham, Nanwalek	-	-	-	1	-	10	-	-	-	4
11	Augustine	2	-	19	1	44	1	-	1	28	-
12	South Cook HS 1a	51	27	85	47	4	13	45	35	43	26
13	South Cook HS 1b	16	3	80	15	86	20	10	9	95	8
14	South Cook HS 1c	-	-	15	-	47	2	-	-	40	-
15	South Cook HS 1d	-	-	-	-	5	-	-	-	4	-
17	Clam Gulch HS	1	51	-	6	-	-	32	40	-	2
18	Tuxedni HS	40	16	-	-	-	-	30	1	-	-
19	Kalgin Island HS	21	14	-	-	-	-	4	-	-	-
20	Redoubt Bay HS	9	1	-	-	-	-	-	-	-	-
45	Clam Gulch	-	12	-	6	-	-	16	40	-	2
46	Outer Kachemak Bay	-	5	1	38	-	41	1	19	-	34
47	SW Cook Inlet	43	10	27	2	6	-	27	3	8	1
48	Kamishak Bay	-	-	4	-	19	-	-	-	11	-
68	Kenai Fjords-west	-	-	-	-	-	1	-	-	-	1
70	Forelands- Beluga CH	1	-	-	-	-	-	-	-	-	-
71	Middle Cook Inlet-Beluga CH	30	30	-	-	-	-	21	5	-	-
72	West Cook Inlet-Beluga CH	27	6	24	1	13	-	16	2	11	-
75	Kachemak- Humpback Whale	-	-	1	-	3	5	-	-	2	3
90	Barren Islands- Fin Whale	-	-	-	-	2	1	-	-	2	-
94	Lower E Kenai- Gray Whale	-	-	-	-	-	1	-	-	-	-
95	NE Kodiak- Gray Whale	-	-	-	-	-	1	-	-	-	-
101	Cook Inlet 1- Harbor Porpoise	8	1	-	-	-	-	-	-	-	-
102	Cook Inlet 2- Harbor Porpoise	20	20	-	-	-	-	14	4	-	-

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Environmental Resource Area Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
103	Cook Inlet 3- Harbor Porpoise	36	25	7	18	-	-	38	22	1	10
104	Cook Inlet 4- Harbor Porpoise	18	3	50	15	4	17	12	9	28	8
105	Cook Inlet 5- Harbor Porpoise	2	-	27	1	38	2	-	1	40	-
136	Kamishak Bay IBA	-	-	4	-	18	-	-	-	13	-
137	Kamishak Bay STEI Habitat	-	-	-	-	1	-	-	-	-	-
138	Tuxedni Is Colony IBA	23	6	-	-	-	-	14	-	-	-
139	Tuxedni Bay IBA	12	3	-	-	-	-	9	-	-	-
140	Redoubt Bay IBA	7	1	-	-	-	-	-	-	-	-
144	Clam Gulch STEI Habitat.	-	1	-	1	-	-	3	4	-	-
145	Outer Kachemak Bay/IBA	4	20	5	77	2	67	8	48	2	97
146	Lower Cook Inlet 153W59N IBA	-	-	8	3	11	10	-	1	11	3
153	Polly Creek Beach	87	37	8	5	-	-	63	11	-	2
154	Chinitna Bay	6	-	13	1	-	-	3	1	2	-

Table A.2-22. 3 Days-(Summer ERA).

ID	Environmental Resource Area Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
0	Land	50	31	32	23	31	20	33	28	29	21
2	SUA: Tyonek North	1	-	-	-	-	-	-	-	-	-
3	SUA: Tyonek South	27	8	-	-	-	-	6	2	-	-
4	SUA: Seldovia, Port Graham, Nanwalek	1	1	3	8	3	22	1	2	2	14
11	Augustine	12	8	35	15	57	15	11	11	43	13
12	South Cook HS 1a	60	54	85	64	7	32	65	57	44	47
13	South Cook HS 1b	38	30	86	43	87	40	39	33	96	36
14	South Cook HS 1c	14	8	38	13	59	17	13	9	57	11
15	South Cook HS 1d	3	1	13	3	26	4	2	2	23	2
16	Inner Kachemak Bay	-	-	-	3	-	5	-	-	-	3
17	Clam Gulch HS	3	55	-	13	-	2	35	45	-	9
18	Tuxedni HS	43	27	1	2	-	-	38	9	-	2
19	Kalgin Island HS	23	20	-	1	-	-	9	5	-	-
20	Redoubt Bay HS	12	2	-	-	-	-	1	-	-	-
21	Trading Bay HS	1	-	-	-	-	-	-	-	-	-
23	Barren Isl. Pinn	-	-	2	1	4	4	-	-	3	2
24	Shelikof MM 2	-	-	1	-	3	-	-	-	2	-
37	Port Chatham Pinniped	-	-	-	-	-	1	-	-	1	1
45	Clam Gulch	2	19	-	13	-	2	20	45	-	9
46	Outer Kachemak Bay	4	10	6	46	4	52	6	25	4	44
47	SW Cook Inlet	55	32	35	16	9	7	45	21	14	12
48	Kamishak Bay	5	3	19	7	39	8	4	5	31	6
49	Katmai NP	-	-	-	-	1	-	-	-	1	-
68	Kenai Fjords-west	-	-	1	1	1	5	-	-	1	3
70	Forelands- Beluga CH	2	-	-	-	-	-	-	-	-	-
71	Middle Cook Inlet-Beluga CH	32	39	-	3	-	-	27	18	-	2
72	West Cook Inlet-Beluga CH	42	26	39	17	28	9	36	19	27	13
75	Kachemak- Humpback Whale	4	1	13	4	16	14	3	2	16	8
77	N Kodiak- Humpback Whale	-	-	-	-	1	-	-	-	1	-
80	Shelikof MM 1	1	-	6	1	14	1	1	1	13	-
81	Shelikof MM 1a	1	-	5	-	9	-	-	-	9	-
82	Shelikof MM 2a	-	-	-	-	2	-	-	-	2	-
90	Barren Islands- Fin Whale	3	1	11	3	18	8	2	1	17	4
94	Lower E Kenai- Gray Whale	-	-	1	1	1	4	-	-	1	2
95	NE Kodiak- Gray Whale	-	-	1	1	2	4	-	-	1	2
98	Shelikof- Gray Whale	-	-	-	-	1	-	-	-	1	-
101	Cook Inlet 1- Harbor Porpoise	11	2	-	-	-	-	1	-	-	-
102	Cook Inlet 2- Harbor Porpoise	21	25	-	2	-	-	17	12	-	1
103	Cook Inlet 3- Harbor Porpoise	40	40	8	27	-	5	48	35	1	19
104	Cook Inlet 4- Harbor Porpoise	34	28	52	35	7	28	36	28	29	27
105	Cook Inlet 5- Harbor Porpoise	17	12	41	18	42	14	17	14	46	14

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Environmental Resource Area Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
135	Shaw Is Colony	-	-	1	-	2	-	-	-	2	-
136	Kamishak Bay IBA	4	3	13	5	27	6	4	4	22	5
137	Kamishak Bay STEI Habitat	-	-	1	-	3	-	-	-	2	-
138	Tuxedni Is Colony IBA	25	12	-	1	-	-	18	4	-	1
139	Tuxedni Bay IBA	15	9	-	1	-	-	12	3	-	1
140	Redoubt Bay IBA	13	2	-	-	-	-	1	-	-	-
144	Clam Gulch STEI Habitat.	-	2	-	2	-	-	3	5	-	1
145	Outer Kachemak Bay/IBA	12	29	16	81	10	76	19	54	11	97
146	Lower Cook Inlet 153W59N IBA	2	2	9	6	11	11	2	3	12	7
147	Barren Islands Marine IBA	-	-	2	-	2	2	-	-	2	1
148	Barren Islands Colonies IBA	-	-	2	-	2	1	-	-	2	1
153	Polly Creek Beach	88	55	9	13	-	1	75	29	1	9
154	Chinitna Bay	14	8	16	7	-	2	12	7	4	5
155	Barren Islands	1	-	2	1	4	3	-	-	3	1

Table A.2-23. 10 Days-(Summer ERA).

ID	Environmental Resource Area Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
0	Land	81	74	75	71	75	68	74	72	74	70
2	SUA: Tyonek North	2	-	-	-	-	-	-	-	-	-
3	SUA: Tyonek South	28	11	-	1	-	-	8	4	-	1
4	SUA: Seldovia, Port Graham, Nanwalek	6	6	11	16	10	32	8	8	10	22
5	SUA: Port Lions	3	3	6	3	10	3	3	3	9	3
6	SUA: Ouzinke	2	1	3	2	6	2	2	1	5	1
11	Augustine	23	25	48	34	67	35	27	29	55	33
12	South Cook HS 1a	62	66	86	75	11	47	73	70	46	62
13	South Cook HS 1b	46	49	88	60	87	58	54	53	97	56
14	South Cook HS 1c	26	27	49	33	64	36	30	28	63	31
15	South Cook HS 1d	15	15	29	19	40	21	17	16	38	18
16	Inner Kachemak Bay	1	1	2	5	1	9	1	1	1	6
17	Clam Gulch HS	5	56	2	17	1	6	37	47	1	14
18	Tuxedni HS	44	33	1	6	-	2	42	16	-	5
19	Kalgin Island HS	24	23	-	3	-	1	12	8	-	2
20	Redoubt Bay HS	13	3	-	-	-	-	2	1	-	-
21	Trading Bay HS	1	-	-	-	-	-	-	-	-	-
23	Barren Isl. Pinn	6	5	11	7	13	10	6	5	13	8
24	Shelikof MM 2	5	5	12	7	17	8	6	6	16	7
25	Shelikof MM 3	2	2	5	2	7	3	2	2	7	2
26	Shelikof MM 4	1	1	2	1	3	1	1	1	3	1
27	Shelikof MM 5	-	-	1	-	2	-	-	-	1	-
28	Shelikof MM 6	-	-	-	-	1	-	-	-	1	-
31	Kodiak Pinniped 1	-	-	1	-	1	1	-	-	1	1
37	Port Chatham Pinniped	2	1	3	2	4	3	2	1	4	2
45	Clam Gulch	4	23	2	18	1	7	23	48	1	14
46	Outer Kachemak Bay	10	18	14	52	10	58	14	31	11	50
47	SW Cook Inlet	60	47	39	31	11	17	56	37	17	26
48	Kamishak Bay	16	18	35	25	53	28	19	21	45	26
49	Katmai NP	3	3	7	4	9	4	3	3	9	3
50	Becharof NWR	-	-	-	-	1	-	-	-	-	-
60	Kodiak NWR-west	-	-	1	-	2	-	-	-	1	-
64	Afognak-west	1	1	3	1	4	1	1	1	4	1
67	Shuyak	2	1	4	2	5	2	2	1	5	2
68	Kenai Fjords-west	3	2	5	4	5	8	3	3	5	6
70	Forelands- Beluga CH	2	1	-	-	-	-	1	-	-	-
71	Middle Cook Inlet-Beluga CH	33	42	1	8	-	2	29	22	-	6
72	West Cook Inlet-Beluga CH	52	47	51	40	39	30	54	42	39	36
73	NPRW Feeding Area	-	-	-	-	1	-	-	-	-	-
75	Kachemak- Humpback Whale	13	13	23	16	25	24	15	13	26	19

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Environmental Resource Area Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
76	Shelikof- Humpback Whale	1	1	3	1	4	1	1	1	4	1
77	N Kodiak- Humpback Whale	4	4	8	4	11	5	4	4	11	4
78	E Kodiak- Humpback Whale	1	-	1	-	1	1	-	-	1	1
80	Shelikof MM 1	12	11	24	15	32	17	13	12	31	14
81	Shelikof MM 1a	7	7	14	8	18	7	8	7	18	7
82	Shelikof MM 2a	3	3	7	3	9	3	4	3	9	3
83	Shelikof MM 3a	1	1	3	1	4	1	1	1	4	1
84	Shelikof MM 4a	-	-	1	-	2	-	-	-	2	-
85	Shelikof MM 5a	-	-	1	-	1	-	-	-	1	-
90	Barren Islands- Fin Whale	14	13	26	17	31	22	15	13	31	18
91	NE Kodiak- Fin Whale	1	1	3	1	3	2	1	1	3	1
94	Lower E Kenai- Gray Whale	3	3	5	4	5	8	3	3	6	5
95	NE Kodiak- Gray Whale	4	4	8	5	8	9	4	4	8	7
98	Shelikof- Gray Whale	3	3	7	3	10	4	3	3	10	3
101	Cook Inlet 1- Harbor Porpoise	11	2	-	-	-	-	1	-	-	-
102	Cook Inlet 2- Harbor Porpoise	22	26	-	6	-	2	18	14	-	5
103	Cook Inlet 3- Harbor Porpoise	42	47	10	33	2	12	52	43	3	26
104	Cook Inlet 4- Harbor Porpoise	39	42	53	46	10	38	46	42	30	41
105	Cook Inlet 5- Harbor Porpoise	24	26	45	31	45	28	29	28	49	29
108	Shelikof- Killer Whale	3	2	7	3	10	4	3	3	9	3
109	E Kodiak- Killer Whale	-	-	1	-	1	1	-	-	1	-
111	NW Afognak Is IBA	1	1	1	1	2	1	1	1	2	1
132	Amalik Bay Colonies IBA	-	-	-	-	1	-	-	-	-	-
133	Ninagiak Is Colonies	-	-	-	-	1	-	-	-	1	-
134	Kiukpalik Is Colony	1	1	2	1	2	1	1	1	2	1
135	Shaw Is Colony	2	2	4	3	6	3	2	2	6	2
136	Kamishak Bay IBA	10	12	21	16	33	17	12	14	29	16
137	Kamishak Bay STEI Habitat	1	1	2	1	5	2	1	1	4	2
138	Tuxedni Is Colony IBA	26	16	-	3	-	1	21	8	-	3
139	Tuxedni Bay IBA	16	11	-	2	-	1	14	6	-	2
140	Redoubt Bay IBA	14	3	-	-	-	-	2	1	-	-
144	Clam Gulch STEI Habitat.	1	3	-	3	-	1	4	6	-	2
145	Outer Kachemak Bay/IBA	19	38	23	83	16	79	29	60	18	97
146	Lower Cook Inlet 153W59N IBA	4	4	10	8	11	12	4	5	12	8
147	Barren Islands Marine IBA	4	3	7	4	8	6	4	3	9	4
148	Barren Islands Colonies IBA	4	3	7	4	8	5	4	3	8	4
153	Polly Creek Beach	89	65	10	22	1	6	81	41	1	17
154	Chinitna Bay	17	15	18	13	1	5	18	14	5	10
155	Barren Islands	6	5	10	6	11	9	6	5	12	7

Table A.2-24. 30 Days-(Summer ERA).

ID	Environmental Resource Area Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
0	Land	96	96	94	94	94	94	96	95	94	94
2	SUA: Tyonek North	2	-	-	-	-	-	-	-	-	-
3	SUA: Tyonek South	28	11	-	2	-	1	8	5	-	1
4	SUA: Seldovia, Port Graham, Nanwalek	8	9	13	18	11	34	10	11	12	24
5	SUA: Port Lions	6	6	10	8	14	9	7	6	13	8
6	SUA: Ouzinke	4	4	6	5	8	6	4	4	8	5
7	SUA: Larsen Bay	-	-	1	-	1	1	-	-	1	-
8	SUA: Karluk	1	1	1	1	2	1	1	1	2	1
9	SUA: Akhiok	-	-	1	-	1	-	-	-	1	-
11	Augustine	26	30	51	39	69	40	31	34	58	38
12	South Cook HS 1a	62	67	86	76	13	48	73	71	47	63
13	South Cook HS 1b	46	51	88	63	87	60	56	55	97	58
14	South Cook HS 1c	27	30	50	36	65	39	32	31	64	35
15	South Cook HS 1d	18	19	32	23	42	26	21	20	40	23
16	Inner Kachemak Bay	1	2	2	6	1	9	2	2	2	7

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Environmental Resource Area Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
17	Clam Gulch HS	5	57	2	18	1	7	37	48	2	14
18	Tuxedni HS	44	33	1	7	-	2	42	17	1	6
19	Kalgin Island HS	24	23	-	3	-	1	12	8	-	2
20	Redoubt Bay HS	13	3	-	-	-	-	2	1	-	-
21	Trading Bay HS	1	-	-	-	-	-	-	-	-	-
23	Barren Isl. Pinn	8	8	13	10	14	13	8	8	14	11
24	Shelikof MM 2	9	10	17	12	21	14	10	11	20	13
25	Shelikof MM 3	5	5	9	6	11	7	5	5	10	7
26	Shelikof MM 4	3	3	5	3	6	4	3	3	6	4
27	Shelikof MM 5	2	2	3	2	4	3	2	2	4	2
28	Shelikof MM 6	1	2	2	2	3	2	2	2	3	2
29	Shelikof MM 7	-	-	1	-	1	-	-	-	1	-
30	Shelikof MM 8	1	1	2	1	2	1	1	1	2	1
31	Kodiak Pinniped 1	1	1	2	2	3	2	1	1	2	2
32	Kodiak Pinniped 2	-	-	-	-	1	-	-	-	-	-
37	Port Chatham Pinniped	2	2	4	3	4	4	3	2	5	3
38	Port Dick Pinniped	-	-	1	1	1	1	-	-	1	-
43	AK Peninsula Pinniped 1	1	1	1	1	2	1	1	1	1	1
45	Clam Gulch	4	24	3	18	1	7	24	48	2	15
46	Outer Kachemak Bay	11	20	15	53	10	59	16	33	12	51
47	SW Cook Inlet	61	50	41	33	13	20	59	40	18	29
48	Kamishak Bay	19	23	38	31	55	33	24	26	48	31
49	Katmai NP	6	6	10	7	13	8	7	7	13	8
50	Becharof NWR	1	1	1	1	1	1	1	1	1	1
51	Alaska Peninsula NWR North	-	1	1	1	1	1	1	1	1	-
59	Kodiak NWR-south	1	1	1	1	1	1	1	1	1	1
60	Kodiak NWR-west	1	1	3	2	3	2	2	1	3	2
64	Afognak-west	2	3	4	3	6	4	3	3	5	3
65	Afognak-north	-	-	-	-	-	-	-	-	1	-
66	Afognak-east	-	-	1	-	1	1	-	-	1	1
67	Shuyak	3	3	5	4	7	5	3	3	7	4
68	Kenai Fjords-west	4	4	6	6	6	10	4	4	6	7
70	Forelands- Beluga CH	2	1	-	-	-	-	1	-	-	-
71	Middle Cook Inlet-Beluga CH	33	42	1	8	1	3	30	22	1	7
72	West Cook Inlet-Beluga CH	55	52	54	45	41	35	58	47	42	42
73	NPRW Feeding Area	1	1	1	1	2	1	1	1	1	1
75	Kachemak- Humpback Whale	15	16	25	19	26	27	17	16	27	22
76	Shelikof- Humpback Whale	3	3	6	4	7	5	4	3	7	4
77	N Kodiak- Humpback Whale	6	6	11	8	13	9	7	6	13	8
78	E Kodiak- Humpback Whale	1	1	3	2	3	2	1	1	3	2
80	Shelikof MM 1	15	17	28	21	35	23	18	18	35	21
81	Shelikof MM 1a	9	10	16	11	20	11	11	10	20	10
82	Shelikof MM 2a	5	6	9	6	11	6	6	6	11	6
83	Shelikof MM 3a	3	3	5	3	6	3	3	3	6	3
84	Shelikof MM 4a	2	2	3	2	3	2	2	2	3	2
85	Shelikof MM 5a	1	1	2	1	2	1	1	1	2	1
86	Shelikof MM 6a	1	1	1	1	1	1	1	1	1	1
87	Shelikof MM 9	1	-	1	-	1	-	1	-	1	-
89	Shelikof MM 11	-	-	1	-	1	-	-	-	1	-
90	Barren Islands- Fin Whale	16	16	28	20	32	26	18	17	32	22
91	NE Kodiak- Fin Whale	2	2	4	3	4	3	2	2	4	3
92	Kodiak- Gray Whale Feeding	-	-	1	-	1	-	-	-	1	-
94	Lower E Kenai- Gray Whale	4	4	7	6	7	9	4	5	7	7
95	NE Kodiak- Gray Whale	5	6	9	7	10	11	6	6	10	9
97	SE Kodiak- Gray Whale	-	-	1	-	1	-	-	-	1	-
98	Shelikof- Gray Whale	6	7	11	8	15	10	8	7	14	8
99	N Shumagin- Gray Whale	-	-	1	1	1	1	1	1	1	1
101	Cook Inlet 1- Harbor Porpoise	11	2	-	-	-	-	1	-	-	-

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Environmental Resource Area Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
102	Cook Inlet 2- Harbor Porpoise	22	27	1	6	1	3	19	15	1	5
103	Cook Inlet 3- Harbor Porpoise	42	47	11	34	3	13	52	44	4	27
104	Cook Inlet 4- Harbor Porpoise	39	43	54	47	11	39	47	44	31	42
105	Cook Inlet 5- Harbor Porpoise	25	29	46	33	46	31	30	30	50	31
108	Shelikof- Killer Whale	6	6	11	8	14	9	7	7	13	8
109	E Kodiak- Killer Whale	1	1	2	1	2	2	1	1	2	1
111	NW Afognak Is IBA	1	1	2	1	2	1	1	1	2	1
112	Uganik and Viekoda Bay IBAs	-	-	1	-	1	1	-	-	1	-
119	Gulf of Alaska Shelf IBA	-	-	1	-	1	-	-	-	1	-
122	Semidi Islands Marine IBA	-	-	-	-	1	-	-	-	1	-
130	South Alinchak Bay Colony	-	-	1	1	1	1	1	-	1	1
132	Amalik Bay Colonies IBA	-	-	1	-	1	-	-	-	1	-
133	Ninagiak Is Colonies	-	-	1	1	1	-	1	-	1	-
134	Kiukpalik Is Colony	1	1	2	2	3	2	1	2	3	2
135	Shaw Is Colony	3	3	6	4	7	5	4	4	7	4
136	Kamishak Bay IBA	12	14	23	19	34	20	15	17	30	18
137	Kamishak Bay STEI Habitat	1	1	2	2	5	3	1	1	4	2
138	Tuxedni Is Colony IBA	26	16	1	4	-	1	21	8	-	3
139	Tuxedni Bay IBA	16	11	1	3	-	1	14	6	-	2
140	Redoubt Bay IBA	14	4	-	-	-	-	2	1	-	-
144	Clam Gulch STEI Habitat.	1	3	-	3	-	1	4	6	-	2
145	Outer Kachemak Bay/IBA	19	39	24	84	16	79	30	60	19	97
146	Lower Cook Inlet 153W59N IBA	4	4	10	8	11	12	4	5	12	8
147	Barren Islands Marine IBA	5	5	9	6	10	8	6	5	10	7
148	Barren Islands Colonies IBA	5	5	8	6	9	7	5	5	9	6
149	SW Kenai Pen Marine IBA	-	-	1	-	1	-	-	-	1	-
151	Gulf of AK Shelf 151W58N IBA	1	-	1	1	1	1	1	1	1	1
153	Polly Creek Beach	89	65	11	23	1	8	82	42	2	19
154	Chinitna Bay	18	16	19	14	1	6	19	16	5	12
155	Barren Islands	7	7	12	9	13	12	8	7	13	10

Table A.2-25. 110 Days-(Summer ERA).

ID	Environmental Resource Area Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
0	Land	97	97	95	96	95	95	97	96	95	95
2	SUA: Tyonek North	2	-	-	-	-	-	-	-	-	-
3	SUA: Tyonek South	28	11	-	2	-	1	8	5	-	1
4	SUA: Seldovia, Port Graham, Nanwalek	8	9	13	18	11	34	10	11	12	24
5	SUA: Port Lions	6	6	10	8	14	9	7	7	13	8
6	SUA: Ouzinke	4	4	6	5	8	6	4	4	8	5
7	SUA: Larsen Bay	-	-	1	1	1	1	-	-	1	-
8	SUA: Karluk	1	1	1	1	2	1	1	1	2	1
9	SUA: Akhiok	-	-	1	-	1	-	-	-	1	-
11	Augustine	26	30	51	39	69	40	32	34	58	38
12	South Cook HS 1a	62	67	86	76	13	49	73	71	47	63
13	South Cook HS 1b	46	51	88	63	87	60	56	55	97	59
14	South Cook HS 1c	27	30	50	36	65	39	32	31	64	35
15	South Cook HS 1d	18	19	32	23	42	26	21	20	41	23
16	Inner Kachemak Bay	1	2	2	6	1	9	2	2	2	7
17	Clam Gulch HS	5	57	2	18	1	7	37	48	2	14
18	Tuxedni HS	44	33	1	7	-	2	42	17	1	6
19	Kalgin Island HS	24	23	-	3	-	1	12	8	-	2
20	Redoubt Bay HS	13	3	-	-	-	-	2	1	-	-
21	Trading Bay HS	1	-	-	-	-	-	-	-	-	-
23	Barren Isl. Pinn	8	8	13	10	14	13	8	8	14	11
24	Shelikof MM 2	9	10	17	12	21	14	11	11	20	13
25	Shelikof MM 3	5	5	9	6	11	7	6	5	11	7
26	Shelikof MM 4	3	3	5	4	6	4	3	3	6	4

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Environmental Resource Area Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
27	Shelikof MM 5	2	2	3	2	4	3	2	2	4	2
28	Shelikof MM 6	1	2	3	2	3	2	2	2	3	2
29	Shelikof MM 7	-	-	1	-	1	-	-	-	1	-
30	Shelikof MM 8	1	1	2	1	2	2	1	1	2	1
31	Kodiak Pinniped 1	1	1	2	2	3	2	1	1	3	2
32	Kodiak Pinniped 2	-	-	1	-	1	-	-	-	1	-
37	Port Chatham Pinniped	2	2	4	3	4	5	3	2	5	3
38	Port Dick Pinniped	-	-	1	1	1	1	-	-	1	-
43	AK Peninsula Pinniped 1	1	1	2	1	2	1	1	1	2	1
45	Clam Gulch	4	24	3	18	1	7	24	48	2	15
46	Outer Kachemak Bay	11	20	15	53	10	59	16	33	12	51
47	SW Cook Inlet	61	50	41	33	13	20	59	40	18	29
48	Kamishak Bay	19	23	38	31	56	33	24	26	49	31
49	Katmai NP	6	6	10	7	13	8	7	7	13	8
50	Becharof NWR	1	1	1	1	1	1	1	1	1	1
51	Alaska Peninsula NWR North	1	1	1	1	1	1	1	1	1	1
59	Kodiak NWR-south	1	1	1	1	2	1	1	1	2	1
60	Kodiak NWR-west	1	1	3	2	3	2	2	1	3	2
64	Afognak-west	3	3	4	3	6	4	3	3	6	3
65	Afognak-north	-	-	-	-	-	-	-	-	1	-
66	Afognak-east	-	-	1	1	1	1	-	-	1	1
67	Shuyak	3	3	5	4	7	5	3	3	7	4
68	Kenai Fjords-west	4	4	6	6	6	10	4	4	6	7
70	Forelands- Beluga CH	2	1	-	-	-	-	1	-	-	-
71	Middle Cook Inlet-Beluga CH	33	42	1	8	1	3	30	22	1	7
72	West Cook Inlet-Beluga CH	55	52	54	45	42	35	58	47	42	42
73	NPRW Feeding Area	1	1	2	1	2	1	1	1	2	1
75	Kachemak- Humpback Whale	15	16	25	19	26	27	17	16	27	22
76	Shelikof- Humpback Whale	3	3	6	4	7	5	4	4	7	4
77	N Kodiak- Humpback Whale	6	6	11	8	13	9	7	7	13	8
78	E Kodiak- Humpback Whale	1	1	3	2	3	2	2	1	3	2
80	Shelikof MM 1	15	17	28	21	35	23	18	18	35	21
81	Shelikof MM 1a	9	10	16	11	20	11	11	10	20	10
82	Shelikof MM 2a	5	6	9	6	11	6	6	6	11	6
83	Shelikof MM 3a	3	3	5	3	6	3	3	3	6	3
84	Shelikof MM 4a	2	2	3	2	3	2	2	2	3	2
85	Shelikof MM 5a	1	1	2	1	2	1	1	1	2	1
86	Shelikof MM 6a	1	1	1	1	2	1	1	1	1	1
87	Shelikof MM 9	1	1	1	1	1	-	1	-	1	1
89	Shelikof MM 11	1	-	1	1	1	1	-	1	1	1
90	Barren Islands- Fin Whale	16	16	28	20	32	26	18	17	32	22
91	NE Kodiak- Fin Whale	2	2	4	3	4	3	2	2	4	3
92	Kodiak- Gray Whale Feeding	-	-	1	-	1	-	-	-	1	-
94	Lower E Kenai- Gray Whale	4	4	7	6	7	10	5	5	7	7
95	NE Kodiak- Gray Whale	5	6	9	7	10	11	6	6	10	9
97	SE Kodiak- Gray Whale	-	-	1	1	1	1	-	-	1	1
98	Shelikof- Gray Whale	6	7	11	8	15	10	8	7	14	8
99	N Shumagin- Gray Whale	1	1	1	1	1	1	1	1	1	1
101	Cook Inlet 1- Harbor Porpoise	11	2	-	-	-	-	1	-	-	-
102	Cook Inlet 2- Harbor Porpoise	22	27	1	6	1	3	19	15	1	5
103	Cook Inlet 3- Harbor Porpoise	42	47	11	34	3	13	52	44	4	27
104	Cook Inlet 4- Harbor Porpoise	39	43	54	47	11	40	47	44	31	42
105	Cook Inlet 5- Harbor Porpoise	25	29	46	33	46	31	30	30	50	31
108	Shelikof- Killer Whale	6	7	11	8	14	9	7	7	13	8
109	E Kodiak- Killer Whale	1	1	2	1	3	2	1	1	2	2
111	NW Afognak Is IBA	1	1	2	1	2	1	1	1	2	1
112	Uganik and Viekoda Bay IBAs	-	-	1	-	1	1	-	-	1	-
119	Gulf of Alaska Shelf IBA	-	-	1	-	1	-	-	-	1	-

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Environmental Resource Area Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
122	Semidi Islands Marine IBA	-	-	1	-	1	-	-	-	1	-
130	South Alinchak Bay Colony	-	-	1	1	1	1	1	-	1	1
132	Amalik Bay Colonies IBA	-	1	1	-	1	-	-	-	1	-
133	Ninagiak Is Colonies	-	-	1	1	1	-	1	-	1	-
134	Kiukpalik Is Colony	1	1	2	2	3	2	2	2	3	2
135	Shaw Is Colony	3	3	6	4	7	5	4	4	7	4
136	Kamishak Bay IBA	12	14	23	19	34	20	15	17	30	19
137	Kamishak Bay STEI Habitat	1	1	2	2	5	3	1	1	4	2
138	Tuxedni Is Colony IBA	26	16	1	4	-	1	21	8	-	3
139	Tuxedni Bay IBA	16	11	1	3	-	1	14	6	-	2
140	Redoubt Bay IBA	14	4	-	-	-	-	2	1	-	-
144	Clam Gulch STEI Habitat.	1	3	-	3	-	1	4	6	-	2
145	Outer Kachemak Bay/IBA	19	39	24	84	16	79	30	60	19	97
146	Lower Cook Inlet 153W59N IBA	4	4	10	8	11	12	4	5	12	8
147	Barren Islands Marine IBA	5	5	9	6	10	8	6	5	10	7
148	Barren Islands Colonies IBA	5	5	8	6	9	7	5	5	9	6
149	SW Kenai Pen Marine IBA	-	-	1	-	1	1	-	-	1	-
151	Gulf of AK Shelf 151W58N IBA	1	1	1	1	1	1	1	1	1	1
153	Polly Creek Beach	89	65	11	23	1	8	82	42	2	19
154	Chinitna Bay	18	16	19	14	1	6	19	16	5	12
155	Barren Islands	7	7	12	9	13	12	8	7	13	10

Tables A.2-26 through A.2-30 represent summer conditional probabilities (expressed as percent chance) that a large oil spill starting at a particular location will contact a certain land segment within:

Table A.2-26. 1 Days-(Summer LS).

ID	Land Segment Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
29	Augustine Island	-	-	-	-	2	-	-	-	2	-
30	Rocky Cove, Tignagvik Point	-	-	-	-	1	-	-	-	-	-
31	Iiamna Bay, Iniskin Bay, Ursus Cove	-	-	-	-	2	-	-	-	1	-
32	Chinitna Point, Dry Bay	-	-	3	-	2	-	-	-	2	-
33	Chinitna Bay	2	-	7	-	-	-	1	-	1	-
34	Iliamna Point	2	-	-	-	-	-	1	-	-	-
35	Chisik Island, Tuxedni Bay	5	1	-	-	-	-	4	-	-	-
36	Redoubt Point	8	1	-	-	-	-	1	-	-	-
37	Drift River, Drift River Terminal	1	-	-	-	-	-	-	-	-	-
38	Kalgin Island	2	3	-	-	-	-	-	-	-	-
54	Clam Gulch, Kasilof	-	-	-	-	-	-	1	-	-	-
55	Deep Creek, Ninilchik, Ninilchik River	-	-	-	-	-	-	1	1	-	-
56	Cape Starichkof, Happy Valley	-	1	-	1	-	-	-	6	-	-
62	Nanwalek, Port Graham	-	-	-	-	-	1	-	-	-	-

Table A.2-27. 3 Days-(Summer LS).

ID	Land Segment Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
25	Spotted Glacier, Sukoi Bay	-	-	-	-	1	-	-	-	-	-
28	Amakdedulia Cove, Bruin Bay, Chenik Head	-	-	-	-	1	-	-	-	1	-
29	Augustine Island	1	-	3	1	8	1	1	1	7	1
30	Rocky Cove, Tignagvik Point	-	-	2	-	6	1	-	-	4	-
31	Iiamna Bay, Iniskin Bay, Ursus Cove	1	-	4	1	9	1	1	1	6	1
32	Chinitna Point, Dry Bay	3	2	9	3	4	2	2	2	6	2
33	Chinitna Bay	9	5	12	6	-	1	8	5	3	4
34	Iliamna Point	3	2	-	1	-	-	4	2	-	-
35	Chisik Island, Tuxedni Bay	10	6	-	-	-	-	8	2	-	-
36	Redoubt Point	15	4	-	-	-	-	3	1	-	-
37	Drift River, Drift River Terminal	3	1	-	-	-	-	-	-	-	-

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Land Segment Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
38	Kalgin Island	4	3	-	-	-	-	-	-	-	-
40	Kustatan River,West Foreland	1	-	-	-	-	-	-	-	-	-
54	Clam Gulch, Kasilof	-	2	-	-	-	-	3	2	-	-
55	Deep Creek, Ninilchik, Ninilchik River	-	1	-	-	-	-	2	2	-	-
56	Cape Starichkof, Happy Valley	-	3	-	4	-	1	1	9	-	3
57	Anchor Point, Anchor River	-	-	-	2	-	1	-	1	-	1
58	Homer, Homer Spit	-	-	-	1	-	1	-	-	-	1
60	China Poot Bay, Gull Island	-	-	-	-	-	1	-	-	-	-
61	Barabara Point, Seldovia Bay	-	-	-	2	-	3	-	-	-	2
62	Nanwalek, Port Graham	-	-	-	1	-	5	-	-	-	3

Table A.2-28. 10 Days-(Summer LS).

ID	Land Segment Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
21	Kaflia, Kukak, Kuliak & Missak Bays	-	-	1	-	1	-	-	-	1	-
22	Devils Cove, Hallo Bay	-	-	1	-	1	1	-	-	1	-
23	Cape Chiniak, Swikshak Bay	-	-	1	1	1	1	-	-	1	1
24	Fourpeaked Glacier	1	1	2	1	3	1	1	1	3	1
25	Spotted Glacier, Sukoi Bay	1	1	2	1	3	1	1	1	3	1
26	Douglas River	1	1	1	1	2	1	1	1	2	1
28	Amakdedulia Cove, Bruin Bay, Chenik Head	1	1	3	2	5	2	1	1	4	2
29	Augustine Island	3	4	7	5	11	6	4	5	11	5
30	Rocky Cove, Tignagvik Point	3	3	6	5	9	5	3	4	8	5
31	Iiamna Bay, Iniskin Bay, Ursus Cove	3	4	8	6	12	6	4	4	9	6
32	Chinitna Point, Dry Bay	5	6	11	7	6	6	6	6	7	6
33	Chinitna Bay	13	12	14	11	1	5	14	12	4	9
34	Iliamna Point	4	4	-	1	-	-	4	3	-	1
35	Chisik Island, Tuxedni Bay	11	9	-	2	-	-	10	5	-	1
36	Redoubt Point	17	6	-	1	-	-	4	2	-	-
37	Drift River, Drift River Terminal	3	1	-	-	-	-	-	-	-	-
38	Kalgin Island	4	4	-	-	-	-	1	-	-	-
40	Kustatan River,West Foreland	1	-	-	-	-	-	-	-	-	-
54	Clam Gulch, Kasilof	-	4	-	2	-	1	5	4	-	2
55	Deep Creek, Ninilchik, Ninilchik River	-	2	-	1	-	-	2	3	-	1
56	Cape Starichkof, Happy Valley	1	4	1	6	-	2	2	10	-	5
57	Anchor Point, Anchor River	-	1	1	3	-	4	1	1	-	3
58	Homer, Homer Spit	-	-	-	2	-	2	-	-	-	2
60	China Poot Bay, Gull Island	-	-	-	1	-	2	-	-	-	1
61	Barabara Point, Seldovia Bay	1	1	1	4	1	6	1	1	1	4
62	Nanwalek, Port Graham	1	2	3	3	3	8	2	2	3	6
63	Elizabeth Island, Port Chatham, Koyuktolik Bay	1	-	1	1	1	2	1	1	1	1
79	Barren Islands, Ushagat Island	1	1	2	1	2	1	1	1	2	1
80	Amatuli Cove, East & West Amatuli Island	-	-	1	-	1	1	-	-	1	1
81	Shuyak Island	1	-	1	1	2	1	1	1	2	1
82	Bluefox Bay, Shuyak Island, Shuyak Strait	1	1	2	1	3	1	1	1	2	1
83	Foul Bay, Paramanof Bay	1	1	1	1	2	1	1	1	2	1
84	Malina Bay, Raspberry Island, Raspberry Strait	-	-	1	-	1	-	-	-	1	-
85	Kupreanof Strait, Viekoda Bay	-	-	-	-	1	-	-	-	-	-

Table A.2-29. 30 Days-(Summer LS).

ID	Land Segment Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
18	Alinchak Bay, Cape Kekurnoi, Bear Bay	-	-	-	-	1	-	-	-	-	-
19	Cape Kubugakli, Kashvik Bay, Katmai Bay	-	-	-	-	1	-	-	-	1	-
20	Amalik, Dakavak & Kinak Bays, Cape Iiktugitak, Takli Is.	-	-	-	-	1	-	-	-	1	-
21	Kaflia, Kukak, Kuliak & Missak Bays	1	1	1	1	2	1	1	1	2	1
22	Devils Cove, Hallo Bay	1	1	2	1	2	1	1	1	2	1
23	Cape Chiniak, Swikshak Bay	1	1	2	1	2	1	1	1	2	1

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Land Segment Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
24	Fourpeaked Glacier	2	2	3	2	3	2	2	2	3	2
25	Spotted Glacier, Sukoi Bay	2	2	3	2	4	2	2	2	4	2
26	Douglas River	1	1	2	1	2	2	1	1	2	1
28	Amakdedulia Cove, Bruin Bay, Chenik Head	2	2	4	3	6	4	2	2	5	3
29	Augustine Island	4	5	8	6	12	7	5	6	11	6
30	Rocky Cove, Tignagvik Point	3	4	6	6	10	6	4	5	8	6
31	liamna Bay, Iniskin Bay, Ursus Cove	4	5	8	7	12	7	5	5	10	7
32	Chinitna Point, Dry Bay	6	6	11	8	6	6	7	7	7	7
33	Chinitna Bay	13	13	14	12	1	6	15	13	5	10
34	Iliamna Point	4	4	-	2	-	-	4	3	-	1
35	Chisik Island, Tuxedni Bay	11	9	-	2	-	1	10	5	-	2
36	Redoubt Point	17	6	-	1	-	-	4	2	-	1
37	Drift River, Drift River Terminal	3	1	-	-	-	-	-	-	-	-
38	Kalgin Island	4	4	-	-	-	-	1	-	-	-
40	Kustatan River,West Foreland	1	-	-	-	-	-	-	-	-	-
54	Clam Gulch, Kasilof	1	4	-	2	-	1	5	4	-	2
55	Deep Creek, Ninilchik, Ninilchik River	-	2	-	1	-	-	3	3	-	1
56	Cape Starichkof, Happy Valley	1	5	1	6	1	2	3	11	1	5
57	Anchor Point, Anchor River	1	1	1	3	1	4	1	2	1	3
58	Homer, Homer Spit	-	-	1	2	-	3	-	1	-	2
60	China Poot Bay, Gull Island	-	-	-	1	-	2	-	-	-	1
61	Barabara Point, Seldovia Bay	1	1	2	4	1	7	2	2	1	5
62	Nanwalek, Port Graham	2	2	3	4	3	8	3	3	3	6
63	Elizabeth Island, Port Chatham, Koyuktolik Bay	1	1	2	1	2	2	1	1	2	2
79	Barren Islands, Ushagat Island	2	1	2	2	3	2	2	1	3	2
80	Amatuli Cove, East & West Amatuli Island	1	1	1	1	1	1	1	1	1	1
81	Shuyak Island	1	1	2	1	2	2	1	1	3	1
82	Bluefox Bay, Shuyak Island, Shuyak Strait	1	2	2	2	3	2	2	2	3	2
83	Foul Bay, Paramanof Bay	1	2	2	2	3	2	1	2	3	2
84	Malina Bay, Raspberry Island, Raspberry Strait	1	1	1	1	2	1	1	1	2	1
85	Kupreanof Strait, Viekoda Bay	-	-	1	1	1	1	1	-	1	1
86	Uganik Bay Uganik Strait, Cape Ugat	-	-	1	1	1	1	-	-	1	1
87	Cape Kuliuk, Spiridon Bay, Uyak Bay	-	-	-	-	1	-	-	-	1	-

Table A.2-30. 110 Days-(Summer LS).

ID	Land Segment Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
16	Capes Kanatak, Lgvak & Unalishagvak, Portage Bay	-	-	-	-	1	-	-	-	-	-
18	Alinchak Bay, Cape Kekurnoi, Bear Bay	-	-	-	-	1	-	-	-	-	-
19	Cape Kubugakli, Kashvik Bay, Katmai Bay	-	-	-	-	1	-	-	-	1	-
20	Amalik, Dakavak & Kinak Bays, Cape Iiktugitak, Takli Is.	-	-	-	-	1	-	-	-	1	-
21	Kaflia, Kukak, Kuliak & Missak Bays	1	1	1	1	2	1	1	1	2	1
22	Devils Cove, Hallo Bay	1	1	2	1	2	1	1	1	2	1
23	Cape Chiniak, Swikshak Bay	1	1	2	1	2	1	1	1	2	1
24	Fourpeaked Glacier	2	2	3	2	3	2	2	2	3	2
25	Spotted Glacier, Sukoi Bay	2	2	3	2	4	2	2	2	4	2
26	Douglas River	1	1	2	1	2	2	1	1	2	1
28	Amakdedulia Cove, Bruin Bay, Chenik Head	2	2	4	3	6	4	2	3	5	3
29	Augustine Island	4	5	8	6	12	7	5	6	11	6
30	Rocky Cove, Tignagvik Point	3	4	6	6	10	6	4	5	8	6
31	liamna Bay, Iniskin Bay, Ursus Cove	4	5	8	7	12	7	5	5	10	7
32	Chinitna Point, Dry Bay	6	6	11	8	6	6	7	7	7	7
33	Chinitna Bay	13	13	14	12	1	6	15	13	5	10
34	Iliamna Point	4	4	-	2	-	-	4	3	-	1
35	Chisik Island, Tuxedni Bay	11	9	-	2	-	1	10	5	-	2
36	Redoubt Point	17	6	-	1	-	-	4	2	-	1
37	Drift River, Drift River Terminal	3	1	-	-	-	-	-	-	-	-
38	Kalgin Island	4	4	-	-	-	-	1	-	-	-

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Land Segment Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
40	Kustatan River,West Foreland	1	-	-	-	-	-	-	-	-	-
54	Clam Gulch, Kasilof	1	4	-	2	-	1	5	4	-	2
55	Deep Creek, Ninilchik, Ninilchik River	-	2	-	1	-	-	3	3	-	1
56	Cape Starichkof, Happy Valley	1	5	1	6	1	2	3	11	1	5
57	Anchor Point, Anchor River	1	1	1	3	1	4	1	2	1	3
58	Homer, Homer Spit	-	-	1	2	-	3	-	1	-	2
60	China Poot Bay, Gull Island	-	-	-	1	-	2	-	-	-	1
61	Barabara Point, Seldovia Bay	1	1	2	4	1	7	2	2	1	5
62	Nanwalek, Port Graham	2	3	3	4	3	8	3	3	3	6
63	Elizabeth Island, Port Chatham, Koyuktolik Bay	1	1	2	1	2	2	1	1	2	2
79	Barren Islands, Ushagat Island	2	1	2	2	3	2	2	1	3	2
80	Amatuli Cove, East & West Amatuli Island	1	1	1	1	1	1	1	1	1	1
81	Shuyak Island	1	1	2	1	2	2	1	1	3	1
82	Bluefox Bay, Shuyak Island, Shuyak Strait	1	2	2	2	3	2	2	2	3	2
83	Foul Bay, Paramanof Bay	1	2	2	2	3	2	1	2	3	2
84	Malina Bay, Raspberry Island, Raspberry Strait	1	1	1	1	2	1	1	1	2	1
85	Kupreanof Strait, Viekoda Bay	1	-	1	1	1	1	1	-	1	1
86	Uganik Bay Uganik Strait, Cape Ugat	-	-	1	1	1	1	-	-	1	1
87	Cape Kuliuk, Spiridon Bay, Uyak Bay	-	-	-	-	1	-	-	-	1	-
111	Seal Bay, Tonki Bay	-	-	-	-	-	-	-	-	1	-

Tables A.2-31 through A.2-35 represent summer conditional probabilities (expressed as percent chance) that a large oil spill starting at a particular location will contact a certain group of land segments within:

Table A.2-31. 1 Days-(Summer GLS).

ID	Grouped Land Segments Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
127	AMNWR W Cook Inlet	15	2	11	-	7	-	5	-	6	-
128	Lake Clark National Park and Preserve	17	2	7	-	-	-	7	-	1	-
129	Redoubt Bay Brown Bears	3	3	-	-	-	-	-	-	-	-
135	Kenai AK State Rec Mgmt Areas	-	2	-	2	-	1	2	7	-	1
136	West Kenai Brown Bears	-	1	-	1	-	-	1	5	-	-
138	Clam Gulch Critical Habitat	-	2	-	1	-	-	2	7	-	-
140	West Kenai Black Bears	-	-	-	-	-	1	-	-	-	-
141	Seldovia side Kachemak Bay	-	-	-	-	-	2	-	-	-	1
142	AMNWR E Cook Inlet	-	-	-	-	-	2	-	-	-	1

Table A.2-32. 3 Days-(Summer GLS).

ID	Grouped Land Segments Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
123	Katmai National Park	-	-	-	-	1	-	-	-	1	-
126	McNeil River State Game Sanctuary and Refuge	-	-	-	-	1	-	-	-	1	-
127	AMNWR W Cook Inlet	38	18	29	11	22	7	22	12	23	9
128	Lake Clark National Park and Preserve	37	18	13	7	-	1	22	10	3	5
129	Redoubt Bay Brown Bears	7	4	-	-	-	-	-	-	-	-
130	Redoubt Bay Critical Habitat Area	1	-	-	-	-	-	-	-	-	-
135	Kenai AK State Rec Mgmt Areas	1	7	1	9	-	7	7	13	-	8
136	West Kenai Brown Bears	-	5	-	5	-	2	5	10	-	4
137	West Kenai Moose	-	1	-	-	-	-	2	1	-	-
138	Clam Gulch Critical Habitat	1	6	-	5	-	1	6	12	-	3
139	Kachemak Bay State Park and Wilderness Park	-	-	-	-	-	1	-	-	-	-
140	West Kenai Black Bears	-	-	-	3	-	6	-	1	-	4
141	Seldovia side Kachemak Bay	-	-	1	3	1	9	-	1	-	6
142	AMNWR E Cook Inlet	-	-	1	3	1	9	-	1	-	6
152	Barren Islands	-	-	-	-	1	-	-	-	-	-

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

Table A.2-33. 10 Days-(Summer GLS).

ID	Grouped Land Segments Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
123	Katmai National Park	4	3	9	4	13	6	4	4	12	4
124	Kukak Bay	1	1	2	1	2	1	1	1	2	1
125	Spring Bear Concentration-1	-	-	-	-	1	1	-	-	1	-
126	McNeil River State Game Sanctuary and Refuge	1	1	3	2	5	3	1	1	4	2
127	AMNWR W Cook Inlet	53	41	43	33	35	25	43	35	36	30
128	Lake Clark National Park and Preserve	43	30	14	15	1	6	32	22	5	12
129	Redoubt Bay Brown Bears	8	5	-	-	-	-	1	1	-	-
130	Redoubt Bay Critical Habitat Area	1	-	-	-	-	-	-	-	-	-
135	Kenai AK State Rec Mgmt Areas	4	13	4	18	2	17	12	21	3	18
136	West Kenai Brown Bears	2	9	2	10	1	8	8	15	1	10
137	West Kenai Moose	-	2	-	1	-	-	2	2	-	1
138	Clam Gulch Critical Habitat	2	10	1	9	-	3	9	17	1	7
139	Kachemak Bay State Park and Wilderness Park	-	-	1	1	-	2	-	-	1	2
140	West Kenai Black Bears	2	2	3	6	3	12	2	3	3	8
141	Seldovia side Kachemak Bay	3	3	5	8	4	16	3	4	4	11
142	AMNWR E Cook Inlet	2	3	5	8	4	16	3	4	4	11
143	AMNWR W Outer Kenai/GOA	1	1	2	1	2	2	1	1	2	1
152	Barren Islands	1	1	3	1	3	2	1	1	3	2
153	Shuyak Island State Park	1	1	3	2	4	2	1	1	4	1
154	AMNWR Afognak and Shuyak Islands	2	2	5	3	8	3	2	2	7	2
156	Kodiak National Wildlife Refuge	3	2	6	3	9	3	3	2	8	3
158	AMNWR W Kodiak/Shelikof	-	-	1	-	1	-	-	-	1	-
159	Kupreanof Strait	-	-	-	-	1	-	-	-	-	-

Table A.2-34. 30 Days-(Summer GLS).

ID	Grouped Land Segments Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
113	Alaska Peninsula National Wildlife Refuge	-	-	1	1	1	-	1	1	1	-
114	AMNWR SW Shelikof/GOA	1	1	2	1	2	1	1	1	2	1
116	SUA: Chignik Chignik Lagoon	-	1	1	1	1	1	1	1	1	-
122	Becharof National Wildlife Refuge	-	1	1	1	1	1	1	1	1	1
123	Katmai National Park	7	8	13	9	16	11	8	8	16	9
124	Kukak Bay	1	2	3	2	4	3	2	2	4	2
125	Spring Bear Concentration-1	-	-	1	1	1	1	-	-	1	1
126	McNeil River State Game Sanctuary and Refuge	2	2	4	3	6	4	2	3	5	3
127	AMNWR W Cook Inlet	56	47	47	39	38	31	48	41	39	36
128	Lake Clark National Park and Preserve	44	32	15	16	2	7	34	23	5	14
129	Redoubt Bay Brown Bears	8	5	-	-	-	-	1	1	-	-
130	Redoubt Bay Critical Habitat Area	1	-	-	-	-	-	-	-	-	-
135	Kenai AK State Rec Mgmt Areas	5	15	5	20	3	19	14	22	4	20
136	West Kenai Brown Bears	2	10	2	12	2	9	9	16	2	11
137	West Kenai Moose	-	2	-	1	-	-	2	2	-	1
138	Clam Gulch Critical Habitat	2	11	1	9	1	4	10	18	1	8
139	Kachemak Bay State Park and Wilderness Park	1	1	1	2	1	2	1	1	1	2
140	West Kenai Black Bears	3	3	4	7	4	13	4	4	4	9
141	Seldovia side Kachemak Bay	3	4	6	9	5	17	5	5	5	13
142	AMNWR E Cook Inlet	3	4	5	9	5	17	5	5	5	12
143	AMNWR W Outer Kenai/GOA	1	1	2	2	2	3	2	2	2	2
152	Barren Islands	2	2	4	3	4	3	2	2	4	3
153	Shuyak Island State Park	2	3	4	3	6	4	3	3	6	3
154	AMNWR Afognak and Shuyak Islands	5	5	9	6	11	8	6	6	11	6
156	Kodiak National Wildlife Refuge	6	7	11	8	15	10	7	7	14	8
158	AMNWR W Kodiak/Shelikof	1	1	3	2	3	2	1	1	3	2
159	Kupreanof Strait	-	-	1	1	1	1	1	-	1	1
164	Afognak Island State Park	-	-	1	-	1	1	-	-	1	1

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

Table A.2-35. 110 Days-(Summer GLS).

ID	Grouped Land Segments Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
113	Alaska Peninsula National Wildlife Refuge	1	1	1	1	1	1	1	1	1	1
114	AMNWR SW Shelikof/GOA	1	1	2	1	2	1	1	1	2	1
116	SUA: Chignik Chignik Lagoon	1	1	1	1	1	1	1	1	1	1
122	Becharof National Wildlife Refuge	1	1	1	1	1	1	1	1	1	1
123	Katmai National Park	7	8	13	9	17	11	8	9	16	9
124	Kukak Bay	1	2	3	2	4	3	2	2	4	2
125	Spring Bear Concentration-1	-	-	1	1	1	1	-	-	1	1
126	McNeil River State Game Sanctuary and Refuge	2	2	4	3	6	4	2	3	5	3
127	AMNWR W Cook Inlet	56	47	47	39	38	31	49	41	39	36
128	Lake Clark National Park and Preserve	44	32	15	17	2	7	34	23	5	14
129	Redoubt Bay Brown Bears	8	5	-	-	-	-	1	1	-	-
130	Redoubt Bay Critical Habitat Area	1	-	-	-	-	-	-	-	-	-
135	Kenai AK State Rec Mgmt Areas	5	15	5	20	3	19	14	22	4	20
136	West Kenai Brown Bears	2	10	2	12	2	9	9	16	2	11
137	West Kenai Moose	-	2	-	1	-	-	2	2	-	1
138	Clam Gulch Critical Habitat	2	11	1	9	1	4	10	18	1	8
139	Kachemak Bay State Park and Wilderness Park	1	1	1	2	1	3	1	1	1	2
140	West Kenai Black Bears	3	4	4	7	4	13	4	4	4	9
141	Seldovia side Kachemak Bay	3	4	6	9	5	17	5	5	5	13
142	AMNWR E Cook Inlet	3	4	6	9	5	17	5	5	5	13
143	AMNWR W Outer Kenai/GOA	1	2	2	2	3	3	2	2	3	2
152	Barren Islands	2	2	4	3	4	3	2	2	4	3
153	Shuyak Island State Park	3	3	4	3	6	4	3	3	6	3
154	AMNWR Afognak and Shuyak Islands	5	5	9	6	12	8	6	6	11	7
156	Kodiak National Wildlife Refuge	7	7	12	9	15	10	8	7	15	9
158	AMNWR W Kodiak/Shelikof	1	1	3	2	3	2	2	1	3	2
159	Kupreanof Strait	1	-	1	1	1	1	1	-	1	1
161	AMNWR E Kodiak/GOA	-	-	1	1	1	1	1	-	1	-
164	Afognak Island State Park	-	-	1	1	1	1	-	-	1	1

Tables A.2-36 through A.2-40 represent summer conditional probabilities (expressed as percent chance) that a large oil spill starting at a particular location will contact a certain boundary segment within:

Table A.2-36. 1 Days-(Summer BS).

ID	Boundary Segment Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4

Note: All rows have all values less than 0.5% and are not shown.

Table A.2-37. 3 Days-(Summer BS).

ID	Boundary Segment Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4

Note: All rows have all values less than 0.5% and are not shown.

Table A.2-38. 10 Days-(Summer BS).

ID	Boundary Segment Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4

Note: All rows have all values less than 0.5% and are not shown.

Table A.2-39. 30 Days-(Summer BS).

ID	Boundary Segment Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
4	Gulf of Alaska	-	-	-	-	1	-	-	-	1	-

Table A.2-40. 110 Days-(Summer BS).

ID	Boundary Segment Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
4	Gulf of Alaska	-	-	1	1	1	-	-	-	1	1

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

Tables A.2-41 through A.2-45 represent winter conditional probabilities (expressed as percent chance) that a large oil spill starting at a particular location will contact a certain environmental resource area within:

Table A.2-41. 1 Days-(Winter ERA).

ID	Environmental Resource Area Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
0	Land	29	9	17	1	14	2	10	5	13	1
3	SUA: Tyonek South	6	1	-	-	-	-	-	-	-	-
4	SUA: Seldovia, Port Graham, Nanwalek	-	-	-	2	-	10	-	-	-	5
11	Augustine	1	-	21	-	52	1	-	-	36	-
12	South Cook HS 1a	50	28	81	48	2	9	42	43	41	30
13	South Cook HS 1b	10	1	78	17	84	24	4	8	95	11
14	South Cook HS 1c	-	-	6	-	46	6	-	-	31	1
15	South Cook HS 1d	-	-	-	-	3	-	-	-	2	-
16	Inner Kachemak Bay	-	-	-	1	-	-	-	-	-	-
17	Clam Gulch HS	-	37	-	2	-	-	27	25	-	1
18	Tuxedni HS	25	13	-	-	-	-	18	1	-	-
19	Kalgin Island HS	9	5	-	-	-	-	1	-	-	-
20	Redoubt Bay HS	3	-	-	-	-	-	-	-	-	-
45	Clam Gulch	-	8	-	2	-	-	16	31	-	1
46	Outer Kachemak Bay	-	6	1	36	-	34	1	25	-	21
47	SW Cook Inlet	54	13	30	2	7	-	30	3	13	1
48	Kamishak Bay	-	-	4	-	27	-	-	-	16	-
68	Kenai Fjords-west	-	-	-	-	-	1	-	-	-	1
71	Middle Cook Inlet-Beluga CH	26	22	-	-	-	-	13	3	-	-
72	West Cook Inlet-Beluga CH	36	8	30	1	17	1	16	2	18	-
75	Kachemak- Humpback Whale	-	-	-	-	1	7	-	-	-	4
90	Barren Islands- Fin Whale	-	-	-	-	-	1	-	-	-	-
94	Lower E Kenai- Gray Whale	-	-	-	-	-	1	-	-	-	-
95	NE Kodiak- Gray Whale	-	-	-	-	-	1	-	-	-	-
137	Kamishak Bay STEI Habitat	-	-	1	-	6	-	-	-	3	-
139	Tuxedni Bay IBA	26	8	-	-	-	-	13	-	-	-
140	Redoubt Bay IBA	5	1	-	-	-	-	-	-	-	-
144	Clam Gulch STEI Habitat.	-	4	-	3	-	-	13	19	-	1
145	Outer Kachemak Bay/IBA	3	22	5	76	1	66	7	59	3	97
146	Lower Cook Inlet 153W59N IBA	4	1	46	23	55	55	1	7	62	28
153	Polly Creek Beach	88	44	5	4	-	-	67	10	-	4
154	Chinitna Bay	5	-	15	1	-	-	2	1	4	-

Table A.2-42. 3 Days-(Winter ERA).

ID	Environmental Resource Area Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
0	Land	61	40	46	28	46	24	41	31	45	25
3	SUA: Tyonek South	8	3	-	-	-	-	2	1	-	-
4	SUA: Seldovia, Port Graham, Nanwalek	1	1	3	11	2	20	1	3	2	14
11	Augustine	12	9	41	17	68	21	11	12	55	16
12	South Cook HS 1a	59	58	81	62	3	21	66	66	41	45
13	South Cook HS 1b	33	30	84	45	85	43	35	38	96	39
14	South Cook HS 1c	8	6	31	16	59	31	7	9	50	20
15	South Cook HS 1d	2	1	10	4	28	12	1	2	21	6
16	Inner Kachemak Bay	-	-	-	3	-	2	-	1	-	2
17	Clam Gulch HS	1	39	-	4	-	1	30	27	-	3
18	Tuxedni HS	27	21	-	2	-	-	24	7	-	2
19	Kalgin Island HS	9	7	-	-	-	-	3	1	-	-
20	Redoubt Bay HS	4	1	-	-	-	-	1	-	-	-
23	Barren Isl. Pinn	-	-	1	1	3	6	-	-	2	3
24	Shelikof MM 2	-	-	-	-	3	1	-	-	2	1
37	Port Chatham Pinniped	-	-	-	-	-	1	-	-	-	-
45	Clam Gulch	1	11	-	4	-	1	18	33	-	3

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Environmental Resource Area Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
46	Outer Kachemak Bay	4	11	5	42	1	39	7	31	3	29
47	SW Cook Inlet	67	42	40	22	11	11	54	28	21	18
48	Kamishak Bay	5	3	24	9	52	13	4	6	40	9
49	Katmai NP	-	-	-	-	1	-	-	-	-	-
68	Kenai Fjords-west	-	-	1	2	1	6	-	-	1	4
70	Forelands- Beluga CH	1	-	-	-	-	-	-	-	-	-
71	Middle Cook Inlet-Beluga CH	27	26	-	2	-	-	17	8	-	1
72	West Cook Inlet-Beluga CH	54	35	48	24	35	15	43	27	38	19
75	Kachemak- Humpback Whale	2	1	7	7	8	18	1	3	7	12
77	N Kodiak- Humpback Whale	-	-	-	-	1	-	-	-	-	-
80	Shelikof MM 1	-	-	3	1	13	6	-	-	10	3
90	Barren Islands- Fin Whale	1	1	7	5	15	19	1	2	12	11
94	Lower E Kenai- Gray Whale	-	-	1	1	1	4	-	-	1	2
95	NE Kodiak- Gray Whale	-	-	1	1	1	4	-	-	1	3
137	Kamishak Bay STEI Habitat	1	1	9	3	22	5	1	2	16	3
139	Tuxedni Bay IBA	31	19	-	2	-	-	22	6	-	2
140	Redoubt Bay IBA	9	3	-	-	-	-	1	-	-	-
144	Clam Gulch STEI Habitat.	1	7	-	5	-	1	15	22	-	4
145	Outer Kachemak Bay/IBA	11	30	13	81	4	72	19	63	8	97
146	Lower Cook Inlet 153W59N IBA	19	20	53	47	56	64	21	31	64	49
153	Polly Creek Beach	88	61	5	12	-	2	81	28	1	10
154	Chinitna Bay	14	9	20	10	1	4	12	10	7	7
155	Barren Islands	-	-	1	1	2	5	-	-	2	3

Table A.2-43. 10 Days-(Winter ERA).

ID	Environmental Resource Area Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
0	Land	90	84	88	81	89	82	85	81	89	81
3	SUA: Tyonek South	8	4	-	1	-	-	3	2	-	1
4	SUA: Seldovia, Port Graham, Nanwalek	5	6	6	18	3	25	6	10	4	21
5	SUA: Port Lions	5	5	10	8	13	13	6	7	12	10
6	SUA: Ouzinke	3	4	7	6	9	8	4	5	8	7
7	SUA: Larsen Bay	-	-	1	1	1	1	-	1	1	1
8	SUA: Karluk	-	-	1	1	1	1	-	1	1	1
11	Augustine	22	27	52	37	76	40	28	32	65	37
12	South Cook HS 1a	60	63	82	66	4	26	71	71	42	49
13	South Cook HS 1b	39	45	85	57	85	51	48	52	96	50
14	South Cook HS 1c	22	27	41	38	62	49	28	32	56	41
15	South Cook HS 1d	16	19	29	28	39	35	20	24	36	30
16	Inner Kachemak Bay	1	1	1	4	-	3	1	2	-	3
17	Clam Gulch HS	2	40	-	5	-	1	31	28	-	4
18	Tuxedni HS	28	22	1	4	-	1	26	9	-	3
19	Kalgin Island HS	10	8	-	1	-	-	4	2	-	1
20	Redoubt Bay HS	4	2	-	-	-	-	1	1	-	-
23	Barren Isl. Pinn	4	5	7	8	7	13	5	6	7	10
24	Shelikof MM 2	7	8	14	13	17	17	8	11	16	15
25	Shelikof MM 3	3	3	6	5	7	7	3	4	7	6
26	Shelikof MM 4	1	1	2	2	3	3	1	1	3	2
27	Shelikof MM 5	-	-	1	-	1	1	-	-	1	1
28	Shelikof MM 6	-	-	-	-	1	-	-	-	1	-
31	Kodiak Pinniped 1	-	-	1	1	1	1	-	-	1	1
37	Port Chatham Pinniped	1	1	2	2	1	3	1	1	2	2
45	Clam Gulch	2	12	-	5	-	1	19	34	-	4
46	Outer Kachemak Bay	7	16	7	45	2	42	11	35	4	33
47	SW Cook Inlet	70	52	44	33	13	20	63	40	24	29
48	Kamishak Bay	18	22	39	31	64	35	23	26	54	31
49	Katmai NP	3	3	6	5	8	7	3	4	7	6
59	Kodiak NWR-south	-	-	1	1	1	1	-	-	1	1

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Environmental Resource Area Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
60	Kodiak NWR-west	1	1	2	2	3	3	2	2	3	3
64	Afognak-west	2	3	5	4	7	7	3	3	7	5
67	Shuyak	2	2	3	3	5	5	2	2	4	4
68	Kenai Fjords-west	2	2	3	5	1	9	2	3	2	7
70	Forelands- Beluga CH	1	1	-	-	-	-	1	-	-	-
71	Middle Cook Inlet-Beluga CH	28	28	-	3	-	1	18	9	-	2
72	West Cook Inlet-Beluga CH	63	53	58	44	44	34	60	47	48	40
75	Kachemak- Humpback Whale	7	9	11	15	10	22	9	12	10	18
76	Shelikof- Humpback Whale	2	2	3	3	5	4	2	2	4	3
77	N Kodiak- Humpback Whale	3	3	6	5	7	7	3	4	6	5
78	E Kodiak- Humpback Whale	-	-	1	1	1	1	-	-	1	1
80	Shelikof MM 1	13	16	24	24	30	31	16	19	29	27
90	Barren Islands- Fin Whale	11	15	21	25	23	35	15	19	22	29
91	NE Kodiak- Fin Whale	1	1	2	2	2	3	1	1	2	2
94	Lower E Kenai- Gray Whale	1	2	2	3	1	5	2	2	2	4
95	NE Kodiak- Gray Whale	2	2	3	4	2	7	2	3	3	5
98	Shelikof- Gray Whale	4	4	7	6	9	8	4	5	9	7
108	Shelikof- Killer Whale	5	5	9	9	11	11	6	7	11	9
109	E Kodiak- Killer Whale	-	-	1	1	1	1	-	-	1	1
137	Kamishak Bay STEI Habitat	8	10	18	15	29	17	10	12	24	15
139	Tuxedni Bay IBA	32	21	1	4	-	1	24	9	-	3
140	Redoubt Bay IBA	9	4	-	-	-	-	2	1	-	-
144	Clam Gulch STEI Habitat.	2	9	1	7	-	3	16	23	-	5
145	Outer Kachemak Bay/IBA	14	35	15	82	5	73	24	66	9	97
146	Lower Cook Inlet 153W59N IBA	24	31	54	54	57	67	31	42	64	56
151	Gulf of AK Shelf 151W58N IBA	-	-	-	-	1	1	-	-	-	-
153	Polly Creek Beach	88	64	6	15	-	4	83	32	1	13
154	Chinitna Bay	16	13	21	14	1	7	16	15	7	12
155	Barren Islands	3	4	7	8	7	13	5	5	7	10

Table A.2-44. 30 Days-(Winter ERA).

ID	Environmental Resource Area Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
0	Land	98	97	97	96	96	96	97	96	97	96
3	SUA: Tyonek South	8	4	-	1	-	-	3	2	-	1
4	SUA: Seldovia, Port Graham, Nanwalek	5	7	7	18	3	25	6	11	5	21
5	SUA: Port Lions	7	9	12	12	14	16	9	11	13	14
6	SUA: Ouzinke	5	6	8	9	10	11	6	8	9	10
7	SUA: Larsen Bay	1	1	1	2	1	2	1	1	1	1
8	SUA: Karluk	1	1	2	2	2	2	1	2	2	2
9	SUA: Akhiok	-	-	-	-	1	1	-	-	1	1
11	Augustine	23	28	53	39	76	42	30	34	65	39
12	South Cook HS 1a	60	63	82	66	4	26	71	71	42	49
13	South Cook HS 1b	39	46	86	57	85	51	48	53	96	51
14	South Cook HS 1c	22	28	42	39	62	50	29	33	56	42
15	South Cook HS 1d	17	22	30	30	40	37	22	26	37	32
16	Inner Kachemak Bay	1	1	1	4	-	3	1	2	-	3
17	Clam Gulch HS	2	40	-	5	-	1	31	28	-	4
18	Tuxedni HS	28	22	1	4	-	1	26	9	-	3
19	Kalgin Island HS	10	8	-	1	-	-	4	2	-	1
20	Redoubt Bay HS	4	2	-	-	-	-	1	1	-	-
23	Barren Isl. Pinn	4	5	7	9	7	14	5	7	7	11
24	Shelikof MM 2	8	11	15	16	18	20	11	14	18	18
25	Shelikof MM 3	4	6	7	8	8	9	6	7	8	8
26	Shelikof MM 4	2	2	3	4	4	4	2	3	4	4
27	Shelikof MM 5	1	1	2	2	2	2	1	1	2	2
28	Shelikof MM 6	1	1	1	1	1	2	1	1	1	1
29	Shelikof MM 7	-	-	1	-	1	1	-	-	1	1

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Environmental Resource Area Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
30	Shelikof MM 8	-	1	1	1	1	1	1	1	1	1
31	Kodiak Pinniped 1	1	1	1	1	1	2	1	1	1	1
37	Port Chatham Pinniped	1	1	2	2	2	4	1	2	2	3
43	AK Peninsula Pinniped 1	-	-	1	1	1	1	-	1	1	1
45	Clam Gulch	2	12	-	5	-	1	19	34	-	4
46	Outer Kachemak Bay	7	16	7	45	2	42	12	35	4	33
47	SW Cook Inlet	70	53	44	33	13	20	63	40	24	29
48	Kamishak Bay	20	24	40	33	64	36	25	29	55	33
49	Katmai NP	4	5	8	7	9	10	5	6	9	8
50	Becharof NWR	-	-	-	-	-	1	-	-	-	-
57	Trinity Islands	-	-	-	-	-	-	-	-	1	-
59	Kodiak NWR-south	1	1	2	2	2	2	1	2	2	2
60	Kodiak NWR-west	2	3	4	4	4	5	3	4	4	4
64	Afognak-west	3	5	6	6	8	8	4	6	8	7
65	Afognak-north	-	-	-	-	-	1	-	-	-	1
67	Shuyak	2	3	4	5	5	6	3	4	5	5
68	Kenai Fjords-west	2	2	3	5	2	9	2	4	2	7
70	Forelands- Beluga CH	1	1	-	-	-	-	1	-	-	-
71	Middle Cook Inlet-Beluga CH	28	28	-	3	-	1	18	9	-	2
72	West Cook Inlet-Beluga CH	64	55	59	46	45	35	61	49	48	41
75	Kachemak- Humpback Whale	7	9	11	15	10	23	9	12	10	19
76	Shelikof- Humpback Whale	3	4	4	5	5	5	4	4	5	5
77	N Kodiak- Humpback Whale	3	4	6	6	7	8	4	5	7	6
78	E Kodiak- Humpback Whale	1	1	1	1	1	1	1	1	1	1
80	Shelikof MM 1	14	19	26	27	31	34	19	22	30	30
89	Shelikof MM 11	-	-	1	1	1	1	-	-	1	1
90	Barren Islands- Fin Whale	12	17	22	26	23	36	17	21	22	31
91	NE Kodiak- Fin Whale	1	1	2	2	2	3	1	2	2	3
94	Lower E Kenai- Gray Whale	1	2	2	4	1	5	2	2	2	4
95	NE Kodiak- Gray Whale	2	2	3	5	2	7	2	3	3	6
97	SE Kodiak- Gray Whale	-	-	1	1	1	1	-	-	1	1
98	Shelikof- Gray Whale	5	7	8	9	10	10	7	8	10	9
99	N Shumagin- Gray Whale	-	-	-	-	-	1	-	-	-	-
108	Shelikof- Killer Whale	6	8	11	12	13	14	8	10	12	12
109	E Kodiak- Killer Whale	1	1	1	1	1	2	1	1	1	1
137	Kamishak Bay STEI Habitat	9	11	19	16	29	18	11	14	25	16
139	Tuxedni Bay IBA	32	21	1	4	-	1	24	9	-	4
140	Redoubt Bay IBA	9	4	-	-	-	-	2	2	-	-
144	Clam Gulch STEI Habitat.	2	9	1	7	-	3	16	23	1	5
145	Outer Kachemak Bay/IBA	14	35	15	82	5	73	24	66	9	97
146	Lower Cook Inlet 153W59N IBA	24	32	54	55	57	68	31	43	64	56
151	Gulf of AK Shelf 151W58N IBA	-	-	1	1	1	1	-	1	1	1
153	Polly Creek Beach	88	64	6	15	-	4	83	32	1	13
154	Chinitna Bay	16	14	21	14	1	7	16	15	7	12
155	Barren Islands	4	5	7	9	7	13	5	6	7	10

Table A.2-45. 110 Days-(Winter ERA).

ID	Environmental Resource Area Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
0	Land	98	97	97	96	97	96	98	96	97	96
3	SUA: Tyonek South	8	4	-	1	-	-	3	2	-	1
4	SUA: Seldovia, Port Graham, Nanwalek	5	7	7	18	3	25	6	11	5	21
5	SUA: Port Lions	7	9	12	12	14	16	9	11	13	14
6	SUA: Ouzinke	5	6	8	9	10	11	6	8	9	10
7	SUA: Larsen Bay	1	1	1	2	1	2	1	1	1	1
8	SUA: Karluk	1	2	2	2	2	2	1	2	2	2
9	SUA: Akhiok	-	-	1	1	1	1	-	-	1	1
11	Augustine	23	28	53	39	76	42	30	34	65	39

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Environmental Resource Area Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
12	South Cook HS 1a	60	63	82	66	4	26	71	71	42	49
13	South Cook HS 1b	39	46	86	57	85	51	48	53	96	51
14	South Cook HS 1c	22	28	42	39	62	50	29	33	56	42
15	South Cook HS 1d	17	22	30	30	40	37	22	26	37	32
16	Inner Kachemak Bay	1	1	1	4	-	3	1	2	-	3
17	Clam Gulch HS	2	40	-	5	-	1	31	28	-	4
18	Tuxedni HS	28	22	1	4	-	1	26	9	-	3
19	Kalgin Island HS	10	8	-	1	-	-	4	2	-	1
20	Redoubt Bay HS	4	2	-	-	-	-	1	1	-	-
23	Barren Isl. Pinn	4	5	7	9	7	14	5	7	7	11
24	Shelikof MM 2	8	12	15	16	19	20	11	14	18	18
25	Shelikof MM 3	4	6	7	8	8	9	6	7	8	8
26	Shelikof MM 4	2	2	3	4	4	4	2	3	4	4
27	Shelikof MM 5	1	1	2	2	2	2	1	1	2	2
28	Shelikof MM 6	1	1	1	2	1	2	1	1	1	2
29	Shelikof MM 7	-	-	1	-	1	1	-	-	1	1
30	Shelikof MM 8	-	1	1	1	1	1	1	1	1	1
31	Kodiak Pinniped 1	1	1	1	1	1	2	1	1	1	1
37	Port Chatham Pinniped	1	1	2	2	2	4	1	2	2	3
43	AK Peninsula Pinniped 1	-	1	1	1	1	1	1	1	1	1
45	Clam Gulch	2	12	-	5	-	1	19	34	-	4
46	Outer Kachemak Bay	7	16	7	45	2	42	12	35	4	33
47	SW Cook Inlet	70	53	44	33	13	20	63	40	24	29
48	Kamishak Bay	20	24	40	33	64	37	25	29	55	33
49	Katmai NP	4	5	8	7	9	10	5	6	9	8
50	Becharof NWR	-	-	-	-	-	1	-	-	-	-
57	Trinity Islands	-	-	-	-	1	1	-	-	1	1
59	Kodiak NWR-south	1	1	2	2	2	2	1	2	2	2
60	Kodiak NWR-west	2	3	4	4	4	5	3	4	4	4
64	Afognak-west	3	5	6	6	8	8	4	6	8	7
65	Afognak-north	-	-	-	-	-	1	-	-	-	1
67	Shuyak	2	3	4	5	5	6	3	4	5	5
68	Kenai Fjords-west	2	2	3	5	2	9	2	4	2	7
70	Forelands- Beluga CH	1	1	-	-	-	-	1	-	-	-
71	Middle Cook Inlet-Beluga CH	28	28	-	3	-	1	18	9	-	2
72	West Cook Inlet-Beluga CH	64	55	59	46	45	35	61	49	48	41
75	Kachemak- Humpback Whale	7	9	11	15	10	23	9	12	10	19
76	Shelikof- Humpback Whale	3	4	4	5	5	5	4	4	5	5
77	N Kodiak- Humpback Whale	3	4	6	6	7	8	4	5	7	6
78	E Kodiak- Humpback Whale	1	1	1	1	1	1	1	1	1	1
80	Shelikof MM 1	14	19	26	27	31	34	19	22	30	30
89	Shelikof MM 11	-	-	1	1	1	1	-	1	1	1
90	Barren Islands- Fin Whale	12	17	22	26	23	36	17	21	22	31
91	NE Kodiak- Fin Whale	1	1	2	2	2	3	1	2	2	3
94	Lower E Kenai- Gray Whale	1	2	2	4	1	5	2	2	2	4
95	NE Kodiak- Gray Whale	2	2	3	5	2	7	2	3	3	6
97	SE Kodiak- Gray Whale	-	-	1	1	1	1	-	-	1	1
98	Shelikof- Gray Whale	5	7	8	9	10	10	7	8	10	9
99	N Shumagin- Gray Whale	-	-	-	-	-	1	-	-	-	-
108	Shelikof- Killer Whale	6	8	11	12	13	14	8	10	12	13
109	E Kodiak- Killer Whale	1	1	1	1	1	2	1	1	1	1
137	Kamishak Bay STEI Habitat	9	11	19	16	29	18	11	14	25	16
139	Tuxedni Bay IBA	32	21	1	4	-	1	24	9	-	4
140	Redoubt Bay IBA	9	4	-	-	-	-	2	2	-	-
144	Clam Gulch STEI Habitat.	2	9	1	7	-	3	16	23	1	5
145	Outer Kachemak Bay/IBA	14	35	15	82	5	73	24	66	9	97
146	Lower Cook Inlet 153W59N IBA	24	32	54	55	57	68	31	43	64	56
151	Gulf of AK Shelf 151W58N IBA	-	-	1	1	1	1	1	1	1	1

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Environmental Resource Area Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
153	Polly Creek Beach	88	64	6	15	-	4	83	32	1	13
154	Chinitna Bay	16	14	21	14	1	7	16	15	7	12
155	Barren Islands	4	5	7	9	7	13	5	6	7	10

Tables A.2-46 through A.2-50 represent winter conditional probabilities (expressed as percent chance) that a large oil spill starting at a particular location will contact a certain land segment within:

Table A.2-46. 1 Days-(Winter LS).

ID	Land Segment Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
29	Augustine Island	-	-	-	-	6	-	-	-	5	-
30	Rocky Cove, Tignagvik Point	-	-	-	-	2	-	-	-	-	-
31	Iiamna Bay, Iniskin Bay, Ursus Cove	-	-	-	-	3	-	-	-	1	-
32	Chinitna Point, Dry Bay	-	-	5	-	3	-	-	-	4	-
33	Chinitna Bay	2	-	10	-	-	-	1	-	3	-
34	Iliamna Point	4	1	1	-	-	-	3	-	-	-
35	Chisik Island, Tuxedni Bay	12	3	-	-	-	-	5	-	-	-
36	Redoubt Point	8	1	-	-	-	-	1	-	-	-
37	Drift River, Drift River Terminal	1	-	-	-	-	-	-	-	-	-
38	Kalgin Island	1	2	-	-	-	-	-	-	-	-
55	Deep Creek, Ninilchik, Ninilchik River	-	-	-	-	-	-	1	-	-	-
56	Cape Starichkof, Happy Valley	-	1	-	1	-	-	-	4	-	-
61	Barabara Point, Seldovia Bay	-	-	-	-	-	1	-	-	-	-
62	Nanwalek, Port Graham	-	-	-	-	-	1	-	-	-	1

Table A.2-47. 3 Days-(Winter LS).

ID	Land Segment Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
25	Spotted Glacier, Sukoi Bay	-	-	-	-	1	1	-	-	1	-
26	Douglas River	-	-	-	-	2	-	-	-	1	-
28	Amakdedulia Cove, Bruin Bay, Chenik Head	-	-	-	-	2	-	-	-	1	-
29	Augustine Island	1	-	6	2	14	3	1	1	12	2
30	Rocky Cove, Tignagvik Point	1	-	4	1	8	1	-	1	6	1
31	Iiamna Bay, Iniskin Bay, Ursus Cove	1	-	5	1	10	2	1	1	8	1
32	Chinitna Point, Dry Bay	2	2	10	4	7	4	2	3	8	3
33	Chinitna Bay	11	7	18	8	1	3	9	8	6	6
34	Iliamna Point	7	5	1	2	-	-	7	3	-	1
35	Chisik Island, Tuxedni Bay	19	11	-	1	-	-	12	3	-	1
36	Redoubt Point	13	5	-	-	-	-	3	1	-	-
37	Drift River, Drift River Terminal	3	1	-	-	-	-	1	-	-	-
38	Kalgin Island	1	2	-	-	-	-	-	-	-	-
40	Kustatan River,West Foreland	1	-	-	-	-	-	-	-	-	-
54	Clam Gulch, Kasilof	-	1	-	-	-	-	1	-	-	-
55	Deep Creek, Ninilchik, Ninilchik River	-	1	-	-	-	-	1	1	-	-
56	Cape Starichkof, Happy Valley	-	3	-	2	-	-	1	6	-	1
57	Anchor Point, Anchor River	-	-	-	1	-	-	-	1	-	1
61	Barabara Point, Seldovia Bay	-	-	-	3	-	2	-	1	-	2
62	Nanwalek, Port Graham	-	-	1	2	-	5	-	-	-	3
63	Elizabeth Island, Port Chatham, Koyuktolik Bay	-	-	-	-	-	1	-	-	-	-
79	Barren Islands, Ushagat Island	-	-	-	-	-	1	-	-	-	-

Table A.2-48. 10 Days-(Winter LS).

ID	Land Segment Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
21	Kaflia, Kukak, Kuliak & Missak Bays	-	-	1	-	1	1	-	-	1	1
22	Devils Cove, Hallo Bay	-	-	1	1	1	1	-	1	1	1
23	Cape Chiniak, Swikshak Bay	-	-	1	1	1	1	-	-	1	1
24	Fourpeaked Glacier	1	1	2	1	2	2	1	1	2	1

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Land Segment Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
25	Spotted Glacier, Sukoi Bay	2	2	4	3	5	5	3	3	5	4
26	Douglas River	2	2	4	3	5	4	2	2	5	3
27	Akumwarvik Bay, McNeil Cove, Nordyke Island	1	1	1	1	1	1	1	1	1	1
28	Amakdedulia Cove, Bruin Bay, Chenik Head	1	1	3	3	5	3	1	2	4	3
29	Augustine Island	4	5	9	7	16	7	5	6	14	7
30	Rocky Cove, Tignagvik Point	3	3	6	4	11	5	3	4	9	4
31	Iiamna Bay, Iniskin Bay, Ursus Cove	3	3	7	5	12	5	3	4	10	5
32	Chinitna Point, Dry Bay	4	5	12	7	8	7	5	6	10	7
33	Chinitna Bay	13	12	20	13	2	7	14	14	7	11
34	Iliamna Point	8	6	1	3	-	1	9	4	1	2
35	Chisik Island, Tuxedni Bay	20	13	-	2	-	1	14	5	-	2
36	Redoubt Point	13	7	-	1	-	-	5	3	-	1
37	Drift River, Drift River Terminal	3	2	-	-	-	-	1	1	-	-
38	Kalgin Island	1	3	-	-	-	-	1	-	-	-
39	Seal River, Big River	1	-	-	-	-	-	-	-	-	-
40	Kustatan River,West Foreland	1	-	-	-	-	-	-	-	-	-
54	Clam Gulch, Kasilof	-	1	-	-	-	-	1	1	-	-
55	Deep Creek, Ninilchik, Ninilchik River	-	1	-	-	-	-	2	1	-	-
56	Cape Starichkof, Happy Valley	1	3	-	2	-	1	2	6	-	2
57	Anchor Point, Anchor River	-	1	-	1	-	-	-	1	-	1
58	Homer, Homer Spit	-	-	-	1	-	-	-	-	-	-
60	China Poot Bay, Gull Island	-	-	-	1	-	1	-	-	-	1
61	Barabara Point, Seldovia Bay	1	1	1	4	-	3	1	2	-	4
62	Nanwalek, Port Graham	1	1	2	4	1	7	1	2	1	5
63	Elizabeth Island, Port Chatham, Koyuktolik Bay	-	-	1	1	-	2	-	1	-	1
79	Barren Islands, Ushagat Island	1	1	1	1	1	2	1	1	1	2
80	Amatuli Cove, East & West Amatuli Island	-	-	1	1	1	1	-	-	1	1
81	Shuyak Island	1	1	1	2	2	2	1	1	2	2
82	Bluefox Bay, Shuyak Island, Shuyak Strait	1	1	2	2	3	3	1	1	3	2
83	Foul Bay, Paramanof Bay	1	1	3	2	4	3	1	1	3	3
84	Malina Bay, Raspberry Island, Raspberry Strait	1	1	1	1	2	2	1	1	2	2
85	Kupreanof Strait, Viekoda Bay	-	-	1	1	1	1	-	-	1	1
86	Uganik Bay Uganik Strait, Cape Ugat	-	-	1	1	1	1	1	1	1	1
87	Cape Kuliuk, Spiridon Bay, Uyak Bay	-	-	-	-	1	1	-	-	1	-

Table A.2-49. 30 Days-(Winter LS).

ID	Land Segment Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
21	Kaflia, Kukak, Kuliak & Missak Bays	-	1	1	1	1	1	1	1	1	1
22	Devils Cove, Hallo Bay	1	1	1	1	2	2	1	1	2	2
23	Cape Chiniak, Swikshak Bay	-	1	1	1	1	1	1	1	1	1
24	Fourpeaked Glacier	1	1	2	2	2	2	1	1	2	2
25	Spotted Glacier, Sukoi Bay	2	3	4	4	5	5	3	3	5	4
26	Douglas River	2	3	4	3	5	4	3	3	5	4
27	Akumwarvik Bay, McNeil Cove, Nordyke Island	1	1	1	1	2	1	1	1	1	1
28	Amakdedulia Cove, Bruin Bay, Chenik Head	2	2	3	3	6	4	2	2	5	3
29	Augustine Island	5	6	9	7	17	8	6	6	15	7
30	Rocky Cove, Tignagvik Point	3	4	7	5	11	5	4	4	9	4
31	Iiamna Bay, Iniskin Bay, Ursus Cove	3	4	7	5	12	6	4	5	10	5
32	Chinitna Point, Dry Bay	4	5	12	8	8	7	5	7	10	7
33	Chinitna Bay	13	12	20	13	2	7	14	14	7	11
34	Iliamna Point	8	6	1	3	-	1	9	5	1	2
35	Chisik Island, Tuxedni Bay	20	13	-	3	-	1	14	5	-	2
36	Redoubt Point	13	7	-	1	-	-	5	3	-	1
37	Drift River, Drift River Terminal	3	2	-	-	-	-	1	1	-	-
38	Kalgin Island	1	3	-	-	-	-	1	-	-	-
39	Seal River, Big River	1	-	-	-	-	-	-	-	-	-
40	Kustatan River,West Foreland	1	-	-	-	-	-	-	-	-	-

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Land Segment Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
54	Clam Gulch, Kasilof	-	1	-	-	-	-	1	1	-	-
55	Deep Creek, Ninilchik, Ninilchik River	-	1	-	-	-	-	2	1	-	-
56	Cape Starichkof, Happy Valley	1	3	-	2	-	1	2	6	-	2
57	Anchor Point, Anchor River	-	1	-	1	-	-	-	1	-	1
58	Homer, Homer Spit	-	-	-	1	-	-	-	-	-	-
60	China Poot Bay, Gull Island	-	-	-	1	-	1	-	-	-	1
61	Barabara Point, Seldovia Bay	1	1	1	4	-	4	1	2	-	4
62	Nanwalek, Port Graham	1	1	2	4	1	7	1	2	1	5
63	Elizabeth Island, Port Chatham, Koyuktolik Bay	-	-	1	1	1	2	-	1	1	2
79	Barren Islands, Ushagat Island	1	1	1	2	2	3	1	1	1	2
80	Amatuli Cove, East & West Amatuli Island	-	1	1	1	1	1	1	1	1	1
81	Shuyak Island	1	1	2	2	2	3	1	2	2	2
82	Bluefox Bay, Shuyak Island, Shuyak Strait	1	2	3	3	3	3	2	2	3	3
83	Foul Bay, Paramanof Bay	2	3	3	3	4	4	2	3	4	4
84	Malina Bay, Raspberry Island, Raspberry Strait	1	1	2	2	2	2	2	2	2	2
85	Kupreanof Strait, Viekoda Bay	1	1	1	1	1	1	1	1	1	1
86	Uganik Bay Uganik Strait, Cape Ugat	1	1	1	2	2	2	1	2	2	2
87	Cape Kuliuk, Spiridon Bay, Uyak Bay	-	1	1	1	1	1	-	1	1	1
88	Karluk Lagoon, Northeast Harbor, Karluk	-	1	1	1	1	1	1	1	1	1

Table A.2-50. 110 Days-(Winter LS).

ID	Land Segment Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
21	Kaflia, Kukak, Kuliak & Missak Bays	-	1	1	1	1	1	1	1	1	1
22	Devils Cove, Hallo Bay	1	1	1	1	2	2	1	1	2	2
23	Cape Chiniak, Swikshak Bay	-	1	1	1	1	1	1	1	1	1
24	Fourpeaked Glacier	1	1	2	2	2	2	1	1	2	2
25	Spotted Glacier, Sukoi Bay	2	3	4	4	5	5	3	3	5	4
26	Douglas River	2	3	4	3	5	4	3	3	5	4
27	Akumwarvik Bay, McNeil Cove, Nordyke Island	1	1	1	1	2	1	1	1	1	1
28	Amakdedulia Cove, Bruin Bay, Chenik Head	2	2	3	3	6	4	2	2	5	3
29	Augustine Island	5	6	9	7	17	8	6	6	15	7
30	Rocky Cove, Tignagvik Point	3	4	7	5	11	5	4	4	9	4
31	Iiamna Bay, Iniskin Bay, Ursus Cove	3	4	7	5	12	6	4	5	10	5
32	Chinitna Point, Dry Bay	4	5	12	8	8	7	5	7	10	7
33	Chinitna Bay	13	12	20	13	2	7	14	14	7	11
34	Iliamna Point	8	6	1	3	-	1	9	5	1	2
35	Chisik Island, Tuxedni Bay	20	13	-	3	-	1	14	5	-	2
36	Redoubt Point	13	7	-	1	-	-	5	3	-	1
37	Drift River, Drift River Terminal	3	2	-	-	-	-	1	1	-	-
38	Kalgin Island	1	3	-	-	-	-	1	-	-	-
39	Seal River, Big River	1	-	-	-	-	-	-	-	-	-
40	Kustatan River,West Foreland	1	-	-	-	-	-	-	-	-	-
54	Clam Gulch, Kasilof	-	1	-	-	-	-	1	1	-	-
55	Deep Creek, Ninilchik, Ninilchik River	-	1	-	-	-	-	2	1	-	-
56	Cape Starichkof, Happy Valley	1	3	-	2	-	1	2	6	-	2
57	Anchor Point, Anchor River	-	1	-	1	-	-	-	1	-	1
58	Homer, Homer Spit	-	-	-	1	-	-	-	-	-	-
60	China Poot Bay, Gull Island	-	-	-	1	-	1	-	-	-	1
61	Barabara Point, Seldovia Bay	1	1	1	4	-	4	1	2	-	4
62	Nanwalek, Port Graham	1	1	2	4	1	7	1	2	1	5
63	Elizabeth Island, Port Chatham, Koyuktolik Bay	-	-	1	1	1	2	-	1	1	2
79	Barren Islands, Ushagat Island	1	1	1	2	2	3	1	1	1	2
80	Amatuli Cove, East & West Amatuli Island	-	1	1	1	1	1	1	1	1	1
81	Shuyak Island	1	1	2	2	2	3	1	2	2	2
82	Bluefox Bay, Shuyak Island, Shuyak Strait	1	2	3	3	3	3	2	2	3	3
83	Foul Bay, Paramanof Bay	2	3	3	3	4	4	2	3	4	4
84	Malina Bay, Raspberry Island, Raspberry Strait	1	1	2	2	2	2	2	2	2	2

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Land Segment Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
85	Kupreanof Strait, Viekoda Bay	1	1	1	1	1	1	1	1	1	1
86	Uganik Bay Uganik Strait, Cape Ugat	1	1	1	2	2	2	1	2	2	2
87	Cape Kuliuk, Spiridon Bay, Uyak Bay	-	1	1	1	1	1	-	1	1	1
88	Karluk Lagoon, Northeast Harbor, Karluk	-	1	1	1	1	1	1	1	1	1

Tables A.2-51 through A.2-55 represent winter conditional probabilities (expressed as percent chance) that a large oil spill starting at a particular location will contact a certain group of land segments within:

Table A.2-51. 1 Days-(Winter GLS).

ID	Grouped Land Segments Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
127	AMNWR W Cook Inlet	23	4	16	-	13	-	6	-	12	-
128	Lake Clark National Park and Preserve	27	5	11	-	-	-	9	-	3	-
135	Kenai AK State Rec Mgmt Areas	-	2	-	1	-	1	2	4	-	1
136	West Kenai Brown Bears	-	-	-	-	-	-	-	1	-	-
137	West Kenai Moose	-	-	-	-	-	-	1	-	-	-
138	Clam Gulch Critical Habitat	-	1	-	1	-	-	2	4	-	-
141	Seldovia side Kachemak Bay	-	-	-	-	-	2	-	-	-	1
142	AMNWR E Cook Inlet	-	-	-	-	-	2	-	-	-	1

Table A.2-52. 3 Days-(Winter GLS).

ID	Grouped Land Segments Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
123	Katmai National Park	-	-	1	-	3	1	-	-	3	-
126	McNeil River State Game Sanctuary and Refuge	-	-	-	-	2	-	-	-	1	-
127	AMNWR W Cook Inlet	46	26	39	17	34	12	28	18	35	14
128	Lake Clark National Park and Preserve	49	28	19	11	1	3	32	16	7	9
129	Redoubt Bay Brown Bears	1	1	-	-	-	-	-	-	-	-
130	Redoubt Bay Critical Habitat Area	1	-	-	-	-	-	-	-	-	-
135	Kenai AK State Rec Mgmt Areas	1	5	-	6	-	4	4	9	-	5
136	West Kenai Brown Bears	-	1	-	1	-	-	1	2	-	1
137	West Kenai Moose	-	2	-	-	-	-	2	1	-	-
138	Clam Gulch Critical Habitat	-	4	-	2	-	-	4	7	-	1
140	West Kenai Black Bears	-	-	-	1	-	2	-	-	-	1
141	Seldovia side Kachemak Bay	-	-	1	5	-	8	-	1	1	6
142	AMNWR E Cook Inlet	-	-	1	5	-	8	-	1	1	6
143	AMNWR W Outer Kenai/GOA	-	-	-	-	-	1	-	-	-	-
152	Barren Islands	-	-	-	-	-	1	-	-	-	1

Table A.2-53. 10 Days-(Winter GLS).

ID	Grouped Land Segments Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
123	Katmai National Park	6	7	13	11	18	14	7	8	16	11
124	Kukak Bay	1	1	2	1	2	2	1	1	2	2
125	Spring Bear Concentration-1	-	-	-	-	1	-	-	-	1	-
126	McNeil River State Game Sanctuary and Refuge	2	2	4	3	7	4	2	3	5	4
127	AMNWR W Cook Inlet	59	47	52	39	44	31	48	41	47	36
128	Lake Clark National Park and Preserve	54	38	21	19	2	8	41	26	8	16
129	Redoubt Bay Brown Bears	1	1	-	-	-	-	-	-	-	-
130	Redoubt Bay Critical Habitat Area	1	1	-	-	-	-	-	-	-	-
131	Trading Bay Moose	1	-	-	-	-	-	-	-	-	-
135	Kenai AK State Rec Mgmt Areas	2	8	1	9	-	6	7	12	1	8
136	West Kenai Brown Bears	-	1	-	1	-	-	1	2	-	1
137	West Kenai Moose	-	2	-	1	-	-	3	2	-	-
138	Clam Gulch Critical Habitat	1	5	-	3	-	1	5	8	-	2
139	Kachemak Bay State Park and Wilderness Park	-	-	-	1	-	1	-	-	-	1
140	West Kenai Black Bears	-	-	1	2	-	3	-	1	-	2
141	Seldovia side Kachemak Bay	2	3	3	9	1	11	2	4	2	10

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Grouped Land Segments Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
142	AMNWR E Cook Inlet	2	3	3	9	1	11	2	4	2	10
143	AMNWR W Outer Kenai/GOA	-	-	1	1	-	2	-	1	1	1
152	Barren Islands	1	1	2	2	2	4	1	1	2	3
153	Shuyak Island State Park	2	2	4	3	5	5	2	2	4	4
154	AMNWR Afognak and Shuyak Islands	4	4	8	7	11	11	4	5	10	8
155	Afognak & Raspberry Winter Elk	2	2	5	5	7	7	3	3	6	6
156	Kodiak National Wildlife Refuge	5	5	10	9	14	13	5	6	13	11
157	Afognak Blacktail Deer	2	2	4	4	6	6	2	2	5	4
158	AMNWR W Kodiak/Shelikof	1	1	2	2	3	3	1	2	3	2
159	Kupreanof Strait	-	-	1	1	1	1	-	-	1	1

Table A.2-54. 30 Days-(Winter GLS).

ID	Grouped Land Segments Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
114	AMNWR SW Shelikof/GOA	-	-	-	-	-	1	-	-	-	1
122	Becharof National Wildlife Refuge	-	-	-	-	-	1	-	-	-	-
123	Katmai National Park	8	10	15	14	20	18	11	12	18	15
124	Kukak Bay	1	1	2	2	3	3	2	2	3	3
125	Spring Bear Concentration-1	-	-	1	-	1	1	-	-	1	-
126	McNeil River State Game Sanctuary and Refuge	2	3	4	4	7	5	3	3	6	4
127	AMNWR W Cook Inlet	60	49	53	41	45	33	50	43	48	38
128	Lake Clark National Park and Preserve	54	38	22	19	2	9	42	27	8	16
129	Redoubt Bay Brown Bears	1	1	-	-	-	-	-	-	-	-
130	Redoubt Bay Critical Habitat Area	1	1	-	-	-	-	-	-	-	-
131	Trading Bay Moose	1	-	-	-	-	-	-	-	-	-
135	Kenai AK State Rec Mgmt Areas	2	8	2	10	1	6	7	12	1	8
136	West Kenai Brown Bears	-	1	-	1	-	-	1	2	-	1
137	West Kenai Moose	-	2	-	1	-	-	3	2	-	1
138	Clam Gulch Critical Habitat	1	6	-	3	-	1	5	8	-	2
139	Kachemak Bay State Park and Wilderness Park	-	-	-	1	-	1	-	-	-	1
140	West Kenai Black Bears	-	-	1	2	-	3	-	1	-	2
141	Seldovia side Kachemak Bay	2	3	3	9	1	11	3	5	2	10
142	AMNWR E Cook Inlet	2	3	3	9	1	11	3	5	2	10
143	AMNWR W Outer Kenai/GOA	-	-	1	1	1	2	-	1	1	2
152	Barren Islands	1	2	2	3	2	4	2	2	2	3
153	Shuyak Island State Park	3	3	4	5	6	6	3	4	5	5
154	AMNWR Afognak and Shuyak Islands	6	7	10	11	12	14	8	9	12	12
155	Afognak & Raspberry Winter Elk	4	5	6	7	8	10	5	6	8	8
156	Kodiak National Wildlife Refuge	9	11	15	15	17	19	11	13	17	17
157	Afognak Blacktail Deer	3	4	5	6	6	8	4	5	6	6
158	AMNWR W Kodiak/Shelikof	2	3	4	5	4	5	3	4	4	5
159	Kupreanof Strait	1	1	1	1	1	1	1	1	1	1
160	Kodiak Blacktail Deer	-	-	-	-	1	-	-	-	1	-
161	AMNWR E Kodiak/GOA	-	-	1	-	1	1	-	-	1	1
164	Afognak Island State Park	-	-	-	1	-	1	-	-	-	1

Table A.2-55. 110 Days-(Winter GLS).

ID	Grouped Land Segments Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
114	AMNWR SW Shelikof/GOA	-	-	-	1	-	1	-	-	-	1
122	Becharof National Wildlife Refuge	-	-	-	-	-	1	-	-	-	-
123	Katmai National Park	8	10	15	14	20	18	11	12	18	15
124	Kukak Bay	1	1	2	2	3	3	2	2	3	3
125	Spring Bear Concentration-1	-	-	1	-	1	1	-	-	1	-
126	McNeil River State Game Sanctuary and Refuge	2	3	4	4	7	5	3	3	6	4
127	AMNWR W Cook Inlet	60	49	53	41	45	33	50	43	48	38
128	Lake Clark National Park and Preserve	54	38	22	19	2	9	42	27	8	16
129	Redoubt Bay Brown Bears	1	1	-	-	-	-	-	-	-	-

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Grouped Land Segments Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
130	Redoubt Bay Critical Habitat Area	1	1	-	-	-	-	-	-	-	-
131	Trading Bay Moose	1	-	-	-	-	-	-	-	-	-
135	Kenai AK State Rec Mgmt Areas	2	8	2	10	1	6	7	12	1	8
136	West Kenai Brown Bears	-	1	-	1	-	-	1	2	-	1
137	West Kenai Moose	-	2	-	1	-	-	3	2	-	1
138	Clam Gulch Critical Habitat	1	6	-	3	-	1	5	8	-	2
139	Kachemak Bay State Park and Wilderness Park	-	-	-	1	-	1	-	-	-	1
140	West Kenai Black Bears	-	-	1	2	-	3	-	1	-	2
141	Seldovia side Kachemak Bay	2	3	3	9	1	11	3	5	2	10
142	AMNWR E Cook Inlet	2	3	3	9	1	11	3	5	2	10
143	AMNWR W Outer Kenai/GOA	-	-	1	1	1	2	-	1	1	2
152	Barren Islands	1	2	2	3	2	4	2	2	2	3
153	Shuyak Island State Park	3	3	4	5	6	6	3	4	5	5
154	AMNWR Afognak and Shuyak Islands	6	7	10	11	12	14	8	9	12	12
155	Afognak & Raspberry Winter Elk	4	5	6	7	8	10	5	6	8	8
156	Kodiak National Wildlife Refuge	9	11	15	16	17	20	11	14	17	17
157	Afognak Blacktail Deer	3	4	5	6	6	8	4	5	6	6
158	AMNWR W Kodiak/Shelikof	2	3	4	5	4	5	3	4	4	5
159	Kupreanof Strait	1	1	1	1	1	1	1	1	1	1
160	Kodiak Blacktail Deer	-	-	-	-	1	-	-	-	1	-
161	AMNWR E Kodiak/GOA	-	-	1	1	1	1	-	-	1	1
164	Afognak Island State Park	-	-	-	1	-	1	-	-	-	1

Tables A.2-56 through A.2-60 represent winter conditional probabilities (expressed as percent chance) that a large oil spill starting at a particular location will contact a certain boundary segment within:

Table A.2-56. 1 Days-(Winter BS).

ID	Boundary Segment Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4

Note: All rows have all values less than 0.5% and are not shown.

Table A.2-57. 3 Days-(Winter BS).

ID	Boundary Segment Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4

Note: All rows have all values less than 0.5% and are not shown.

Table A.2-58. 10 Days-(Winter BS).

ID	Boundary Segment Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4

Note: All rows have all values less than 0.5% and are not shown.

Table A.2-59. 30 Days-(Winter BS).

ID	Boundary Segment Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4

Note: All rows have all values less than 0.5% and are not shown.

Table A.2-60. 110 Days-(Winter BS).

ID	Boundary Segment Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	PL 1	PL 2	PL 3	PL 4
4	Gulf of Alaska	-	-	1	-	-	1	-	-	-	-

Tables A.2-61 through A.2-64 represent combined probabilities (expressed as percent chance), over the assumed life of the Lease Sale 244 Action Area, Alternatives 1, 3a, 3b, 3c, 4a, 4b, 5, or 6, of one or more spills ≥1,000 bbl, and the estimated number of spills (mean), occurring and contacting a certain:

Table A.2-61. Environmental Resource Area.

ERA ID	Environmental Resource Area Name	1 day		3 days		10 days		30 days	
		%	mean	%	mean	%	mean	%	mean
0	Land	2	0.02	9	0.09	18	0.19	21	0.23

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ERA ID	Environmental Resource Area Name	1 day		3 days		10 days		30 days	
		%	mean	%	mean	%	mean	%	mean
3	SUA:Tyonek South	1	0.01	1	0.01	2	0.02	2	0.02
4	SUA: Seldovia, Port Graham, Nanwalek	-	0.00	1	0.01	2	0.02	3	0.03
5	SUA: Port Lions	-	0.00	-	0.00	1	0.01	2	0.02
6	SUA: Ouzinke	-	0.00	-	0.00	1	0.01	1	0.01
11	Augustine	1	0.01	4	0.04	7	0.08	8	0.08
12	South Cook HS 1a	9	0.09	13	0.14	14	0.16	14	0.16
13	South Cook HS 1b	4	0.04	9	0.10	12	0.13	12	0.13
14	South Cook HS 1c	1	0.01	3	0.03	7	0.08	8	0.08
15	South Cook HS 1d	-	0.00	1	0.01	5	0.05	5	0.06
16	Inner Kachemak Bay	-	0.00	-	0.00	-	0.00	1	0.01
17	Clam Gulch HS	5	0.05	6	0.06	6	0.06	6	0.06
18	Tuxedni HS	3	0.03	4	0.04	5	0.05	5	0.05
19	Kalgin Island HS	2	0.02	2	0.02	3	0.03	3	0.03
20	Redoubt Bay HS	-	0.00	1	0.01	1	0.01	1	0.01
23	Barren Isl. Pinniped	-	0.00	-	0.00	1	0.02	2	0.02
24	Shelikof MM 2	-	0.00	-	0.00	2	0.02	3	0.03
25	Shelikof MM 3	-	0.00	-	0.00	1	0.01	1	0.01
26	Shelikof MM 4	-	0.00	-	0.00	-	0.00	1	0.01
37	Port Chatham Pinniped	-	0.00	-	0.00	-	0.00	1	0.01
45	Clam Gulch	1	0.01	2	0.02	3	0.03	3	0.03
46	Outer Kachemak Bay	3	0.03	4	0.04	5	0.06	6	0.06
47	SW Cook Inlet	4	0.04	8	0.09	11	0.11	11	0.11
48	Kamishak Bay	-	0.00	2	0.02	6	0.06	6	0.07
49	Katmai NP	-	0.00	-	0.00	1	0.01	2	0.02
60	Kodiak NWR-west	-	0.00	-	0.00	-	0.00	1	0.01
64	Afognak-west	-	0.00	-	0.00	1	0.01	1	0.01
67	Shuyak	-	0.00	-	0.00	1	0.01	1	0.01
68	Kenai Fjords-west	-	0.00	-	0.00	1	0.01	1	0.01
71	Middle Cook Inlet-Beluga CH	4	0.04	5	0.05	5	0.06	5	0.06
72	West Cook Inlet-Beluga CH	3	0.03	7	0.08	11	0.12	12	0.13
75	Kachemak- Humpback Whale	-	0.00	1	0.01	3	0.03	3	0.03
76	Shelikof- Humpback Whale	-	0.00	-	0.00	-	0.00	1	0.01
77	N Kodiak- Humpback Whale	-	0.00	-	0.00	1	0.01	1	0.01
80	Shelikof MM 1	-	0.00	-	0.00	4	0.04	5	0.05
81	Shelikof MM 1a	-	0.00	-	0.00	1	0.01	1	0.01
82	Shelikof MM 2a	-	0.00	0	0.00	-	0.00	1	0.01
90	Barren Islands- Fin Whale	-	0.00	1	0.01	4	0.04	4	0.05
94	Lower E Kenai- Gray Whale	-	0.00	-	0.00	1	0.01	1	0.01
95	NE Kodiak- Gray Whale	-	0.00	-	0.00	1	0.01	1	0.01
98	Shelikof- Gray Whale	-	0.00	-	0.00	1	0.01	2	0.02
102	Cook Inlet 2- Harbor Porpoise	2	0.02	2	0.02	2	0.02	2	0.02
103	Cook Inlet 3- Harbor Porpoise	3	0.03	4	0.04	4	0.05	5	0.05
104	Cook Inlet 4- Harbor Porpoise	1	0.01	4	0.04	5	0.05	5	0.05
105	Cook Inlet 5- Harbor Porpoise	-	0.00	2	0.02	3	0.04	4	0.04
108	Shelikof- Killer Whale	-	0.00	-	0.00	1	0.01	2	0.02
136	Kamishak Bay IBA	-	0.00	1	0.01	2	0.02	2	0.02
137	Kamishak Bay STEI Habitat	-	0.00	-	0.00	2	0.02	2	0.02
138	Tuxedni Is Colony IBA	1	0.01	1	0.01	2	0.02	2	0.02
139	Tuxedni Bay IBA	1	0.01	3	0.03	3	0.03	3	0.03
140	Redoubt Bay IBA	-	0.00	1	0.01	1	0.01	1	0.01
144	Clam Gulch STEI Habitat.	-	0.00	1	0.01	1	0.01	1	0.01
145	Outer Kachemak Bay/IBA	7	0.07	9	0.09	10	0.10	10	0.10
146	Lower Cook Inlet 153W59N IBA	2	0.02	4	0.04	5	0.05	5	0.05
147	Barren Islands Marine IBA	-	0.00	-	0.00	1	0.01	1	0.01
148	Barren Islands Colonies IBA	-	0.00	-	0.00	-	0.00	1	0.01

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ERA ID	Environmental Resource Area Name	1 day		3 days		10 days		30 days	
		%	mean	%	mean	%	mean	%	mean
153	Polly Creek Beach	8	0.09	11	0.11	12	0.12	12	0.12
154	Chinitna Bay	1	0.01	2	0.02	3	0.03	4	0.04
155	Barren Islands	-0	0.00	-	0.00	1	0.01	2	0.02

Table A.2-62. Land Segment.

LS ID	Land Segment Name	1 days		3 days		10 days		30 days	
		%	mean	%	mean	%	mean	%	mean
25	Spotted Glacier, Sukoi Bay	-	0.00	-	0.00	-	0.00	1	0.01
26	Douglas River	-	0.00	-	0.00	-	0.00	1	0.01
28	Amakdedulia Cove, Bruin Bay, Chenik Head	-	0.00	-	0.00	-	0.00	1	0.01
29	Augustine Island	-	0.00	-	0.00	1	0.01	1	0.01
30	Rocky Cove, Tignagvik Point	-	0.00	-	0.00	1	0.01	1	0.01
31	liamna Bay, Iniskin Bay, Ursus Cove	-	0.00	-	0.00	1	0.01	1	0.01
32	Chinitna Point, Dry Bay	-	0.00	1	0.01	1	0.01	2	0.02
33	Chinitna Bay	-	0.00	2	0.02	3	0.03	3	0.03
34	Iliamna Point	-	0.00	1	0.01	1	0.01	1	0.01
35	Chisik Island, Tuxedni Bay	1	0.01	2	0.02	2	0.02	2	0.02
36	Redoubt Point	-	0.00	1	0.01	1	0.01	1	0.01
56	Cape Starichkof, Happy Valley	-	0.00	-	0.00	1	0.01	1	0.01
62	Nanwalek, Port Graham	-	0.00	-	0.00	1	0.01	1	0.01
83	Foul Bay, Paramanof Bay	0	0.00	-	0.00	-	0.00	1	0.01

Table A.2-63. Grouped Land Segment.

GLS ID	Grouped Land Segment Name	1 days		3 days		10 days		30 days	
		%	mean	%	mean	%	mean	%	mean
123	Katmai National Park	-	0.00	-	0.00	2	0.02	2	0.02
126	McNeil River State Game Sanctuary and Refuge	-	0.00	-	0.00	1	0.01	1	0.01
127	AMNWR W Cook Inlet	1	0.01	6	0.06	10	0.11	11	0.11
128	Lake Clark National Park and Preserve	1	0.02	5	0.05	7	0.07	7	0.07
129	Redoubt Bay Brown Bears	-	0.00	-	0.00	1	0.01	1	0.01
135	Kenai AK State Rec Mgmt Areas	-	0.00	1	0.01	2	0.02	2	0.02
136	West Kenai Brown Bears	-	0.00	1	0.01	1	0.01	1	0.01
138	Clam Gulch Critical Habitat	-	0.00	1	0.01	1	0.01	1	0.01
140	West Kenai Black Bears	-	0.00	-	0.00	1	0.01	1	0.01
141	Seldovia side Kachemak Bay	-	0.00	-	0.00	1	0.01	1	0.01
142	AMNWR E Cook Inlet	-	0.00	-	0.00	1	0.01	1	0.01
152	Barren Islands	-	0.00	-	0.00	-	0.00	1	0.01
153	Shuyak Island State Park	-	0.00	-	0.00	-	0.00	1	0.01
154	AMNWR Afognak and Shuyak Islands	-	0.00	-	0.00	1	0.01	2	0.02
155	Afognak & Raspberry Winter Elk	-	0.00	-	0.00	-	0.00	1	0.01
156	Kodiak National Wildlife Refuge	-	0.00	-	0.00	1	0.01	2	0.02
157	Afognak Blacktail Deer	-	0.00	-	0.00	-	0.00	1	0.01
158	AMNWR W Kodiak/Shelikof	-	0.00	-	0.00	-	0.00	1	0.01

Table A.2-64. Boundary Segment.

BS ID	Boundary Segment Name	1 days		3 days		10 days		30 days	
		%	mean	%	mean	%	mean	%	mean

Note: All rows have all values less than 0.5% and are not shown.

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

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APPENDIX B

Very Large Oil Spill (VLOS) Estimate for an Exploration Well in the (Federal) Cook Inlet Planning Area, Alaska

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Table of Contents

List of Tables

List of Figures

Page Left Intentionally Blank

Appendix B. Very Large Oil Spill (VLOS) Estimate for an Exploration Well in the (Federal) Cook Inlet Planning Area, Alaska

B-1. Blowout Event and Oil Spill Modeled for Cook Inlet (Federal Waters)

The hypothetical Cook Inlet very-large-oil-spill (VLOS) well as modeled by BOEM initiates at a "worst-case" rate of 2,135 stock-tank barrels of oil per day (stbbls/d) on day one of the event. The oil discharge rate declines to 1,525 stbbls/d with a cumulative discharge of 48,898 stbbls by day 30. The maximum estimated time required to complete a relief well at the VLOS site is 80 days (BOEM, 2012). By day 80 of the discharge event the daily oil discharge has declined to 1,382 stbbls/d with a cumulative oil discharge of 121,467 stbbls.

B-2. Siting of Hypothetical Incident ("Blowout") Cook Inlet VLOS Well

A candidate well site in Federal waters on the flank of a known oil pool (Cosmopolitan field) was adopted as the site for a hypothetical uncontrolled discharge of oil directly into the Cook Inlet marine environment from an exploration well. Although this discharge event is entirely hypothetical and very unlikely to occur in the course of drilling a well at this location, the modeled discharge provides a realistic basis for evaluating the environmental impacts of an oil discharge.

As a known oil pool with several well penetrations but little production beyond extensive flow-testing (47,902 stbbls[1]), the Cosmopolitan field is the most credible candidate proxy for a model for an uncontrolled discharge into the Federal waters of southern Cook Inlet. Oil flow rates from various wells at Cosmopolitan field have ranged from 110 to 1,000 stbbls/d.[2] No wells to date have tested the Cosmopolitan oil pool on the west flank where it may extend into Federal waters (Federal waters lie >3.5 st. mi.[3] from shore). BlueCrest Energy has proposed to develop the Cosmopolitan oil resources with 33 extended-reach wells from an onshore pad ~3.3 st. mi. east of the field midpoint, with initial field production of 5,000 stbbls/d and rising to 17,000 stbbls/d within 5 years (Lidji, 2015b). In 2005, Pioneer (Natural Resources Alaska) forecast a recoverable resource potential of 30 to 100 million barrels (MMstbbls) of oil for the Cosmopolitan field (Lidji, 2014).

B-3. Results of Exploratory Drilling in Federal OCS Waters of Cook Inlet, 1977-1985

In the southern part of Cook Inlet, the Tertiary-age rocks that host the commercial fields in northern Cook Inlet and at Cosmopolitan field are very thin or absent except in the northern part of the Cook Inlet (Federal) planning area. The locations of oil and gas fields, the Cook Inlet (Federal) planning area, and the southern extent of Tertiary-age rocks in the Cook Inlet geologic basin are shown in Figure B-1. The wells drilled in the Federal waters of southern Cook Inlet mostly targeted prospects involving Cretaceous through Jurassic ages, as enumerated in the stratigraphic column of Figure B-2.

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[1] *Flow tests of the Cosmopolitan field Starichkof pay zone in the discovery well in 1967 produced 20°API oil at an aggregate rate of 110 stbbls/d (well data for Starichkof State No. 1 well). A total of 14,851 stbbls was produced at rates up to 1,000 stbbls/d in a deviated well by ConocoPhillips in 2003 (Bailey, 2014). In 2007 Pioneer produced 33,000 stbbls of oil at rates of approximately 300 stbbls/d from a horizontal sidetrack that undulated through the pay zone (Bailey, 2014). All of this produced oil was trucked to the Tesoro refinery at Nikiski and the new BlueCrest plan for field development also calls for trucking the oil to Nikiski (Lidji, 2015a).*

[2] *stbbls/d: stock-tank or surface barrels (gas-free at 60°F and 1 atmosphere or 14.73 psia).*

[3] *st. mi.: statute miles; 1 nautical mile (n. mi.) = 1.15078 st. mi.*

None of the 14 wells[4] drilled elsewhere on the Federal waters of Cook Inlet from 1977 to 1985 encountered significant quantities of oil or gas (BOEM, 2006, page 2 and fig. 4). The general observation obtained by the exploration drilling was that the Jurassic-Cretaceous-age target reservoirs offer scant porosity owing to extensive chemical cements that plugged pores prior to invasion by oil. For this reason, the rocks generally offer little storage space for petroleum, and even in the case of oil-bearing rocks, lack the ability to flow oil to a wellbore at any significant rate. Two exploration wells encountered oil in Upper Cretaceous sandstones (age: 66-99 million years ago) and in flow tests recovered oil at estimated rates of several barrels per day to 68 barrels per day.[5]

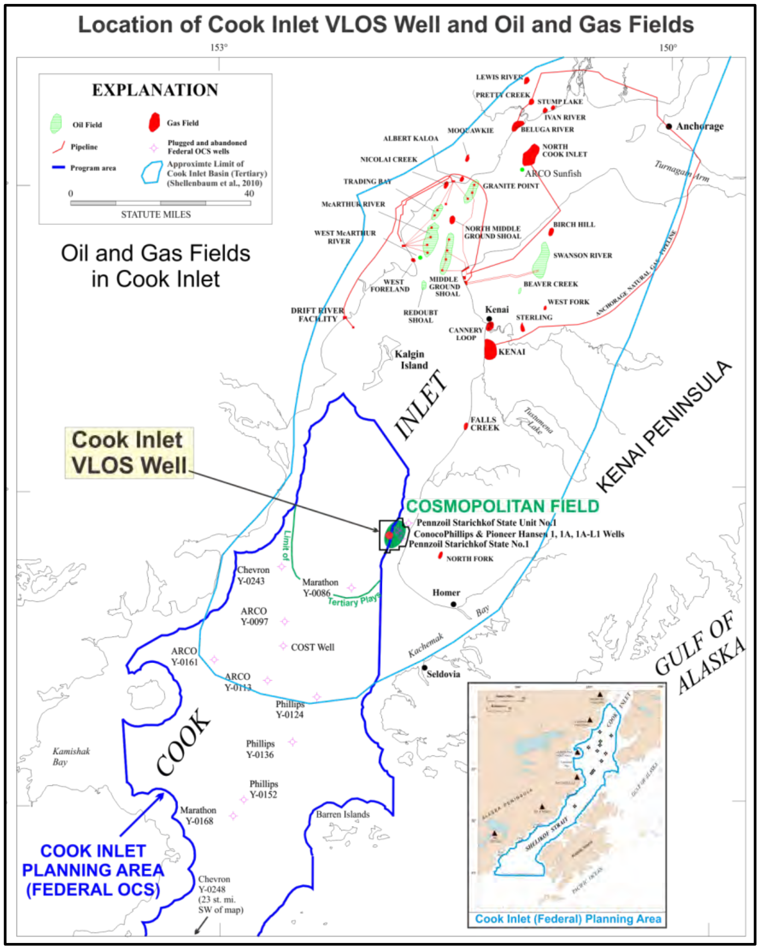

Figure B-1. Location of Cook Inlet VLOS well at Cosmopolitan field. *Figure includes commercial oil and gas fields in northern Cook Inlet geological basin, outline of northern part of Cook Inlet (Federal) planning area, and ten exploration wells plus a stratigraphic data well ("COST" well) drilled in the period from 1977-1985.*

[4] Thirteen wells were drilled on leases over identified oil/gas prospects. Of the 13 explorations wells, 3 wells were sidetracks or re-drills, for a total of 10 actual prospects tested. The first well, drilled in 1977, was a "continental offshore stratigraphic test" or "COST" well drilled by an industry consortium to obtain geological data.

[5] The Y-0097 "Raven" well recovered 28.5°API oil at perhaps several barrels per day (oil flowing into lower part of test tubing that was then sampled by a wireline device) from Upper Cretaceous sandstones at the top of the Kaguyak Formation. The Y-0086 "Guppy" well recovered 30.1°API oil at an estimated rate of 68 barrels per day (15 barrels of black oil recovered in 5.3 hours of flow) from Upper Cretaceous sandstones at the base of the Kaguyak Formation, shown in the stratigraphic column in Figure B-2.

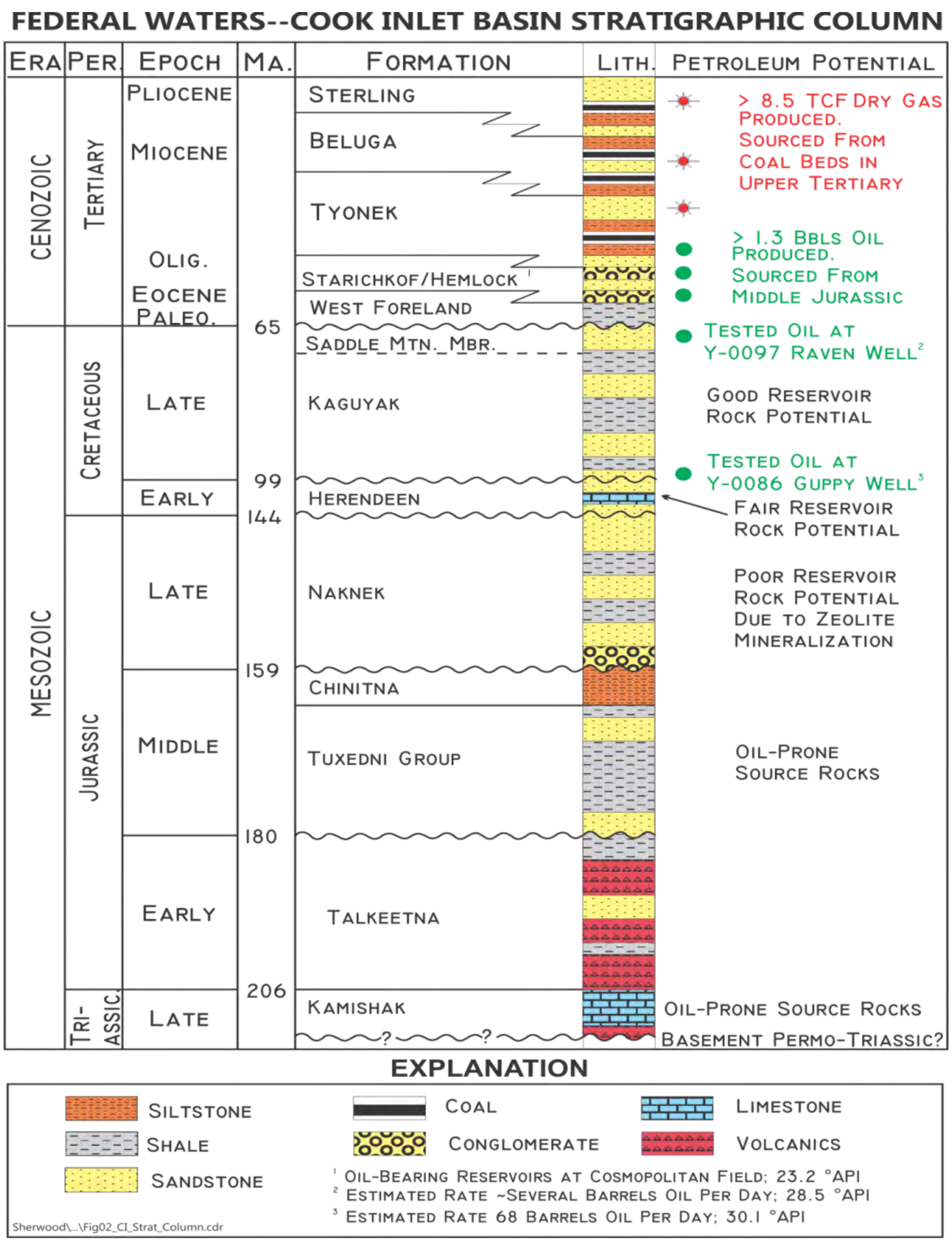

Figure B-2. Stratigraphic column for Cook Inlet geologic basin. *Adapted from BOEM, 2006, Figure 5, p.15.*

The Cook Inlet VLOS well was located to maximize key geological characteristics that drive high flow rates—principally a thick reservoir in this case—and then modeled for potential discharge volumes in a blowout event. Only an oil column is forecast to be penetrated by the VLOS well and no gas- or water-saturated reservoirs participate in the flow and act to limit the oil discharge. The improbability of a discharge event of the modeled magnitude is not considered in the analysis.

The hypothetical oil discharge is assumed to originate from an exploration well on the west flank of the Cosmopolitan field that straddles Federal and State waters in the Cook Inlet, as shown in Figure B-1. Seismic mapping indicates that most of the Cosmopolitan oil pool is located beneath State of Alaska waters. Seismic mapping also shows that at least part of the oil pool—specifically the “Starichkof” conglomerate and sandstones in the upper part of the oil pool—may extend west into

Federal OCS waters. At the 1967 Pennzoil Starichkof State 1 discovery well, oil was tested from sandstones and conglomerates in the interval 6,754-6,928 ft bkb. The oil-bearing sandstones are informally termed the "Starichkof sands" and are illustrated in the log profile shown in Figure B-3. A deeper reservoir unit—the Hemlock conglomerate—is water-bearing at the discovery well but is elsewhere oil bearing. Oil-bearing Hemlock sandstones may extend west into Federal OCS waters as well.

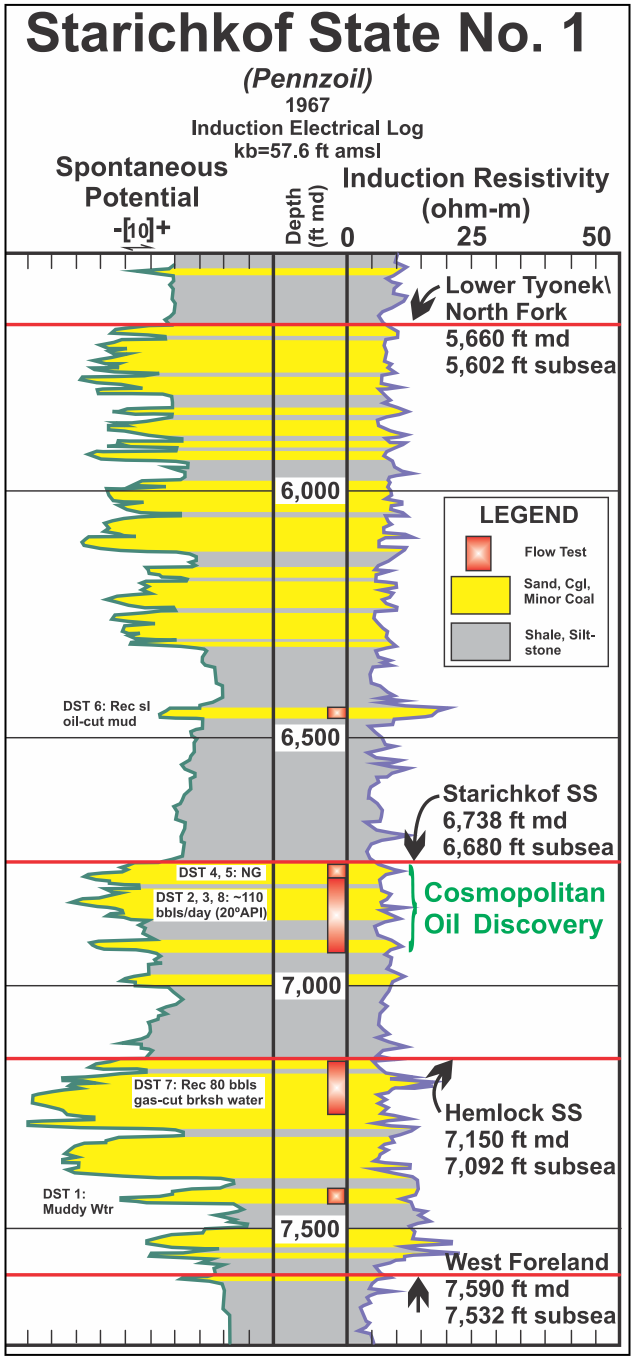

Figure B-3. Spontaneous-Potential/Resistivity Log of Discovery Well
(Cosmopolitan Oil Field). Includes Key Stratigraphic Datum and Results of Flow Tests.

Seismic mapping at Cosmopolitan field is frustrated by distortions of key reflections in the Starichkof-Hemlock-West Foreland interval over the crest of the Cosmopolitan oil field. Thus, the true extent(s) of the oil pool(s) at the Cosmopolitan field remain uncertain. For purposes of modeling the potential oil discharge from a Cook Inlet VLOS well, it is assumed that oil-charged reservoirs extend west into Federal OCS waters. The oil column exposed to the wellbore of the VLOS well is assumed to involve the entirety of the Starichkof sandstone reservoir and about one-quarter of the Hemlock conglomerate reservoir.

B-4. The Gemini Solutions *AVALON/MERLIN* Computer Model for Worst-Case Discharge

The computer model used to forecast the flow of fluids out of the Cook Inlet VLOS well is a state-of-the-art proprietary commercial program by Gemini Solutions, Inc. of Richmond, Texas (Gemini, 2015). The program is constructed as a desktop finite-difference simulator that divides the active flow system into many small cells and then iterates through time-increments of flow with re-assessments that successively modify the state[6] of each cell in the flow system. Cells may be defined in radial or Cartesian coordinates and both types of models are typically tested and compared. Finite-difference models use approximations to relevant differential equations to calculate changes (e.g., pressures, fluid saturations, etc. in the case of fluid flow) within each cell. The incremental approach minimizes approximation errors by confining individual calculations to small, individual cells and makes it possible to quantify behavior across complex systems with internal discontinuities (e.g., flow from reservoir to open wellbore to casing to production manifold to pipeline, etc.). The model is robust, offering the capability to model fluid behavior through fundamental compositional data or through measured physical properties that can be used to forecast (through empirical correlations among fluid and rock properties) other properties.

The *Gemini Solutions Inc* model consists of two components, "*AVALON*" and "*MERLIN*", that respectively simulate: 1) flow up a system of tubular passages (or "tubular system"); and 2) inflow (into the bottom of a well) from a pressurized porous reservoir. Each of these two capacities varies in a regular manner with the wellbore pressure at the reservoir during flow. The correlative capacities of these two components of the flow system determine the natural discharge rate that can be achieved through the exit point at the top of the well. The maximum discharge capacity of the two-component system is determined at the intersection of the "inflow" capacity of the formation to yield oil to the wellbore and the "outflow" or take-away capacity of the tubular system that comprises the well plumbing. Figure B-4 illustrates the graphic solution for the natural flow capacity obtained at the intersection of the inflow and outflow performance relations for a particular reservoir and wellbore tubular system. Figure B-4 also illustrates the effect of different wellbore or casing sizes on natural flow rate (generally, larger pipe allows a higher flow rate).

In theory, the maximum possible discharge rate can be limited by either the aggregate outflow capacity of the tubular system or by the reservoir inflow capacity at the base of the well. In the design of development wells and take-away pipelines, these two components of the flow system, the tubular system and the reservoir, are balanced to achieve the most efficient long-term recovery of hydrocarbons from the reservoir. For a high-yield reservoir early in the production life of the well, the discharge rate is usually limited by the choke effect of wellbore tubular systems that are insufficient to accommodate the maximum potential inflow from the reservoir.

The capacity for flow up the open (uncased) wellbore and the casing is governed by the tubular system properties (diameter, length, roughness, and frictional resistance), the driving formation pressure, and the density characteristics and thermal effects of the multiphase oil-gas-water mix (ranging from gassy liquid(s) to wet gas) moving upward through the wellbore. Flowing pressure in the wellbore at the reservoir face is likewise a function of the aggregate density of the multiphase

[6] *Properties such as pressure, oil viscosity, gas-oil ratio, oil saturation, relative permeability to oil, etc.*

wellbore fluids, frictional and gravitational resistance to flow, ambient pressure (wellhead exterior), and reservoir pressure.

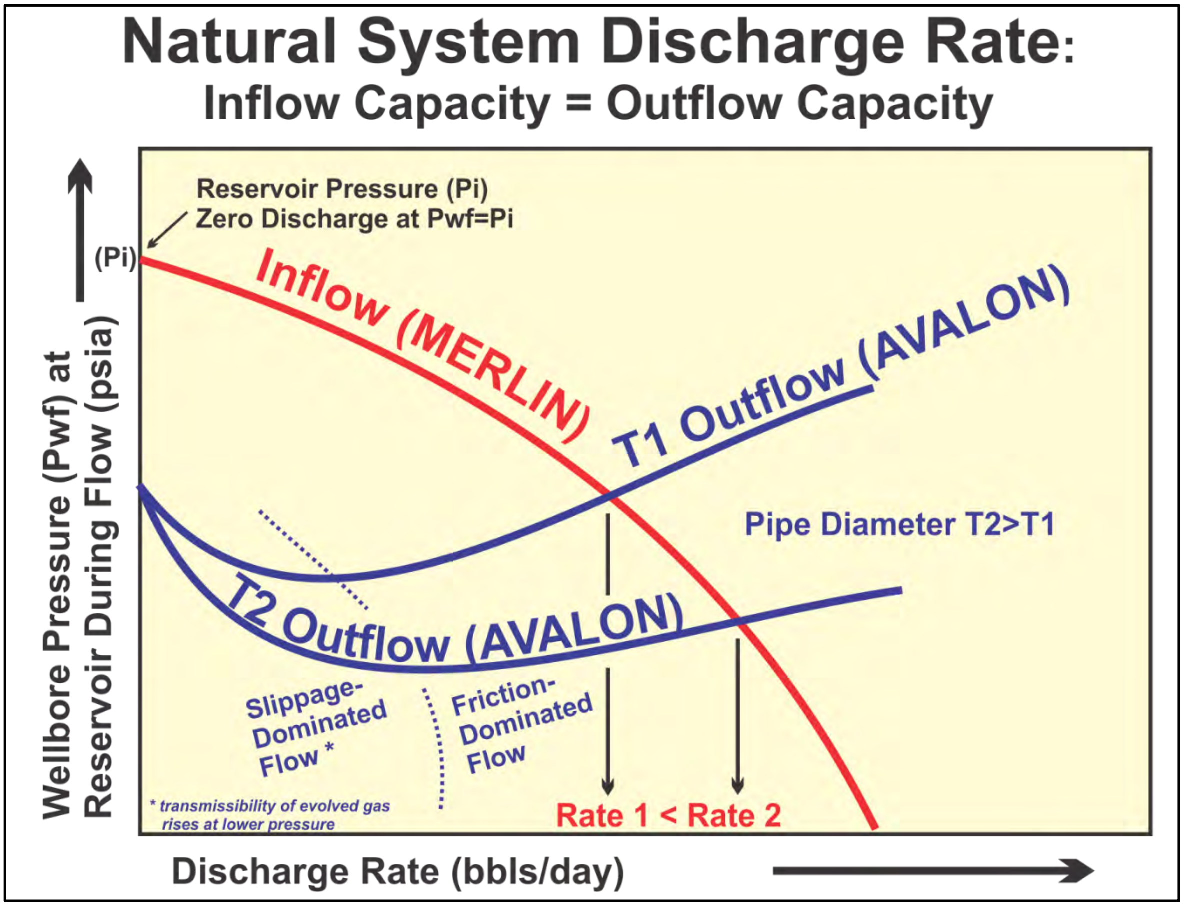

Figure B-4. Inflow and outflow performances for volumetric discharge rates as a function of wellbore pressure. *Intersections of inflow and outflow curves determine the natural discharge rate of a given reservoir-wellbore system. Large and small (diameter) wellbores are represented; in general, larger wellbores permit higher discharge rates.*

The inflow from the reservoir formation is chiefly governed by flowing bottom-hole pressure, pore system size and connectivity, formation pressure, drive mechanism, fluid compositions, fluid properties at reservoir conditions of pressure and temperature, and the length of the wellbore segment passing through the reservoir formation. The geological model for inflow is discussed further below in order to illustrate how key geological variables control discharge rate.

B-5. Darcy Radial Flow Equation and Sources of Basic Data for Cook Inlet VLOS Model

The most important variables for the reservoir inflow component of the discharge model include the aggregate thickness of flow units (h), initial (reservoir pore) pressure (Pi), flowing bottom-hole pressure (Pwf), permeability-to-oil (k_o) of the reservoir formation, and oil viscosity (μ_o). Inflow rates are particularly sensitive to permeability, which at extremes can vary across 7 orders of magnitude (0.01-10,000 mD) or greater, although more typically in the range between 10-1,000 mD. Oil viscosity and oil formation volume factor can vary by several factors. Possible quantitative ranges for variables are listed in the key below the Darcy radial-flow equation (presented below) to convey a sense of variance among the key variables and relative sensitivities to discharge rate.

At any particular instance, the flow of fluids out of a reservoir and into a well, or "inflow", is grossly governed by the Darcy radial flow equation, as summarized in its simplest form for an oil reservoir below. The purpose of including the equation here is to illustrate the roles of the key variables in determining oil flow rate, denoted in the convention of petroleum engineers as "q_o". Note that in the basic Darcy equation the discharge-limiting constraint imposed by the wellbore tubular system is represented only by the assumed wellbore bottom-hole flowing pressure (Pwf). In practice, the latter is supplied by the *AVALON* analysis of the system of tubulars from the reservoir to the surface. As can be seen in the Darcy radial flow equation, a high value for Pwf acts to oppose inflow; when Pwf=Pi, the inflow rate (q_o) falls to zero, as shown in Figure B-4.

Darcy radial flow *(steady-state) equation from Ahmed (2010, p. 435, equation 6-144)*

$$q_o = \frac{0.00708 * k_o * h * (Pi - Pwf)}{\mu_o * B_{oi} * ((\ln r_e / r_w) + S)}$$

where q_o= oil discharge rate, stock-tank barrels/day (stbbls/d);
k_o=permeability to oil, millidarcys (mD), range 0.01- >10,000 mD;
h= thickness, ft, typically 10-200 ft;
Pi = initial reservoir pore pressure, psi, typically 1,500-20,000 psia;
Pwf = bottom-hole flowing pressure, psi, typically 300-8,000 psia;
μ_o = oil viscosity, centipoise (cP), typically 0.1 to 30.0 cP;
B_{oi} = oil formation volume factor, reservoir bbls per stock-tank bbl, typically 1.0-3.0;
r_e = drainage radius, ft, typically 1,000-30,000 ft;
r_w = radius of well, ft, typically 0.35 to 0.73 ft;
S = skin factor, dimensionless, typically 0-500.

Many other variables of lesser importance that do not appear in the Darcy radial flow equation are required for the *AVALON/MERLIN* reservoir inflow simulator. Table B-1 summarizes some of the key reservoir and fluid properties and model parameters that formed the input data to the reservoir inflow model. Table B-1 also lists the wellbore flowing pressure (Pwf) obtained from the *AVALON* modeling of outflow capacity.

Table B-1. Summary of Selected Model Data for BOEM WCD Model for Lower Cook Inlet VLOS Well.

Selected Model VLOS Well Data (two columns)			
Initial Reservoir Pressure (p_i, psia)	3,120	Exponent for Gas Relative Permeability Curve (n_G, a curve shape factor)	3.5
Flowing Bottom-Hole Pressure (p_{wf}, psia) - Modeled by *AVALON/MERLIN*	1,594	Oil Gravity (°API)	23.2
Reservoir Temperature, T, °F (°R)	138 (598)	Initial Oil Formation Volume Factor (Boi or FVF, reservoir volume/surface or stock-tank volume)	1.165
Reservoir Porosity (ϕ, fraction of rock volume)	0.17	Initial Gas-Oil Ratio (Rsi or GOR, standard cubic feet gas per surface or stock-tank bbl oil)	421
Reservoir Horizontal Permeability (k_H, mD)	20	Oil Bubble Point Pressure (Pb, psia)	2,257
Reservoir Vertical Permeability (k_V, mD)	2	Dead (Gas-Free) Oil Viscosity at Standard (Surface) Conditions (μ_{OD}, cp)	7.90
True Stratigraphic Thickness (TST, or Darcy "h", ft)	201	Oil Viscosity at Initial Reservoir Pressure (μ_{Oi}, cP)	2.83
True Vertical Thickness Flow Units (TVT or simulation-model "h", ft)	210	Oil Viscosity at Bubble-Point Pressure (μ_{OB}, cP)	2.66
Formation Dip (degrees departure from horizontal, °)	~17°	Skin Factor (S)	0
Drainage Radius (r_e, ft)	1,490	Reservoir Oil Density (ρ_{OI}, g/cm^3)	0.8158
Well Radius at Reservoir (r_W, ft)	0.396	Static Pressure Gradient of Reservoir Oil (psi/ft)	0.3533
Initial Oil Saturation (Soi, fraction of porosity)	0.63	Specific Gas Gravity (SGG, Air=1.0)	0.66

Selected Model VLOS Well Data (two columns)			
Connate, Initial, or Irreducible Water Saturation (Swi, fraction of porosity)	0.37	Formation or Rock Compressibility (Cf, microsips or v/v/psi*10^{-6})	3.72
Residual Oil to Gas (Sorg, fraction of porosity)	0.30	Oil Compressibility (Co, microsips or v/v/psi*10^{-6})	7.01
Residual Oil to Water (Sorw, fraction of porosity)	0.40	Brine Compressibility (Cw, microsips or v/v/psi*10^{-6})	3.05
Critical Gas Saturation (Sgc, fraction of porosity)	0.10	Total Compressibility (Ct, microsips or v/v/psi*10^{-6})	9.266
Endpoint for Oil Relative Permeability Curve (kro, fraction of "k_H")	0.90	Brine Salinity (ppm NaCl)	16,000
Endpoint for Water Relative Permeability Curve (krw, fraction of "k_H")	0.15	Brine Viscosity (μ_W, cP)	0.523
Endpoint for Gas Relative Permeability Curve (krg, fraction of "k_H")	1.00	Water Volume Factor (B_W, reservoir volume/standard volume)	1.012
Exponent for Oil-Water Relative Permeability Curve (n_{OW}, a curve shape factor)	3.5	Assumed Casing Roughness (inches)	0.0018
Exponent for Oil-Gas Relative Permeability Curve (n_{OG}, a curve shape factor)	3.5	Assumed Open-Hole Roughness (inches)	0.1
Exponent for Water Relative Permeability Curve (n_W, a curve shape factor)	3.5	Ambient Wellhead Temperature (°F)	30

Notes: psi, pounds per square inch; °R, °Rankine (=°F+460); Boi, oil volume factor (aka FVF or formation volume factor); rb/stb, reservoir barrels per stock-tank barrel of oil (at 1 atmosphere and 60°F); Rsi, gas saturation (aka GOR or gas-oil ratio); scf/stb, standard cubic feet of gas per stock-tank barrel of oil (at 1 atmosphere and 60°F); cP, centipoise.

In the Cook Inlet VLOS well discharge model, no "skin" factors related to the near-wellbore alteration of the reservoir that might limit flow rate or arrest the discharge were incorporated into the model. The "skin factor (S)" shown in the Darcy radial flow equation above usually quantifies the plugging of reservoir pores (by drilling fluid solids) that often accompanies the drilling of a well; for the Cook Inlet VLOS model "S" is set to zero (no effect on discharge rate). Furthermore, the VLOS model assumes that no "bridging" or collapse of the open segment of the wellbore is present to restrict or terminate flow. And, no near-wellbore reservoir boundaries (such as faults) are invoked to limit the potential drainage area. The drainage area for the well is bounded at a radius of 1,490 ft (160 acres).

Reservoir pressure and temperature are forecast from data collected in the Pennzoil Starichkof State 1 well located ~2.0 statute miles east of the Cook Inlet VLOS well location. Estimates for reservoir porosity and permeability are based on core and log data from offsetting wells and are consistent with properties published for Cook Inlet fields with Hemlock-Lower Kenai Group reservoirs, as shown in Table B-2.

Table B-2. Cook Inlet Oil Fields, Hemlock-Kenai Group, Reservoir Properties*

Oil Field (Pool)	Porosity (%)	Permeability (mD)	Connate Water (Swi)	Oil Viscosity at Initial Reservoir Conditions (cp)	Oil Gravity (°API)	Specific Gas Gravity (Air=1.0)
Granite Point (Hemlock Undefined Oil)	11	5	0.45	NR	34	0.68
McArthur River (Middle Kenai Oil) **	14	10	0.39	NR	41-44	0.8
McArthur River (Hemlock Oil)	10.5	53	0.35	1.19	33.1	NR
McArthur River (Middle Kenai G Oil)	18.1	65	0.35	1.09	34	NR
McArthur River (Undefined Oil)	4.9	6.3	0.34	1.13	33	NR
Middle Ground Shoal ("A")	16	15	0.4	NR	39	NR
Middle Ground Shoal ("B", "C", and "D")	16	15	0.4	NR	36-38	NR
Middle Ground Shoal ("E", "F", and "G")	11	10	0.30-0.40	0.85	36-38	NR
Redoubt Shoal (Undefined Oil)	11.5	6	0.38	2	26.5	NR

Oil Field (Pool)	Porosity (%)	Permeability (mD)	Connate Water (Swi)	Oil Viscosity at Initial Reservoir Conditions (cp)	Oil Gravity (°API)	Specific Gas Gravity (Air=1.0)
Swanson River (Hemlock Oil)	21	55	0.4	NR	30	NR
Trading Bay (G NE Hemlock NE)	12	12	0.36	1.036	35.8-36.2	NR
Trading Bay (Hemlock Oil)	15	10	NR	1.78	28	NR
Trading Bay (Middle Kenai "B" Oil)	NR	NR	NR	8.1	20	NR
Trading Bay (Middle Kenai "C" Oil)	NR	NR	NR	4.1	25	NR
Trading Bay (Middle Kenai "D" Oil)	20	250	NR	1.24	26	NR
Trading Bay (Middle Kenai "E" Oil)	20	130	NR	7.1	30.7	NR
Trading Bay (Undefined Oil)	NR	NR	NR	NR	23	NR
West McArthur River (Oil)	12	30	0.32	3.4	28.4	0.93
Averages	***14.2***	***44.82***	***0.37***	***2.75***	***31.29***	***0.80***

Notes: * as reported by the Alaska Oil and Gas Conservation Commission at web page for 2004 and 2005 pool statistics at http://doa.alaska.gov/ogc/annual/annindex.html (accessed April 24, 2015)
** "Middle Kenai Group" refers to lower Tyonek Formation and Upper Hemlock Formation in some fields

The gross thickness of the oil-bearing sandstones at the Cook Inlet VLOS well is extrapolated from the Starichkof and Hemlock sandstones penetrated at the Pennzoil Starichkof State 1 well. Because of the poor continuity of individual sandstones, a composite approach was taken to estimating a model for net pay at the VLOS well, using net/gross ratios established for the Starichkof and Hemlock sequences. Those results are summarized below:

Pennzoil Starichkof State 1 Well

Starichkof Sandstone Unit, 6,744-7,150 ft md bkb; gross=406 ft; net sandstone= 153 ft; overall net/gross= 0.38.

Hemlock Conglomerate Unit, 7,150-7,590 ft md bkb; gross= 440 ft; net sandstone= 280 ft; overall net/gross= 0.64.

The net/gross ratios are coupled with seismic isopach mapping and corrections for formation dip to obtain an estimated true-stratigraphic thickness of 201 ft for the “pay” or aggregated flow units (“h”) for the VLOS model. Table B-3 summarizes pay thickness (aggregate oil-bearing reservoirs) data for Cook Inlet fields and pools. A basin-wide map of the pay thickness data shown in Figure B-5 places the pay thickness assumed at the Cook Inlet VLOS well (210 ft) in context.

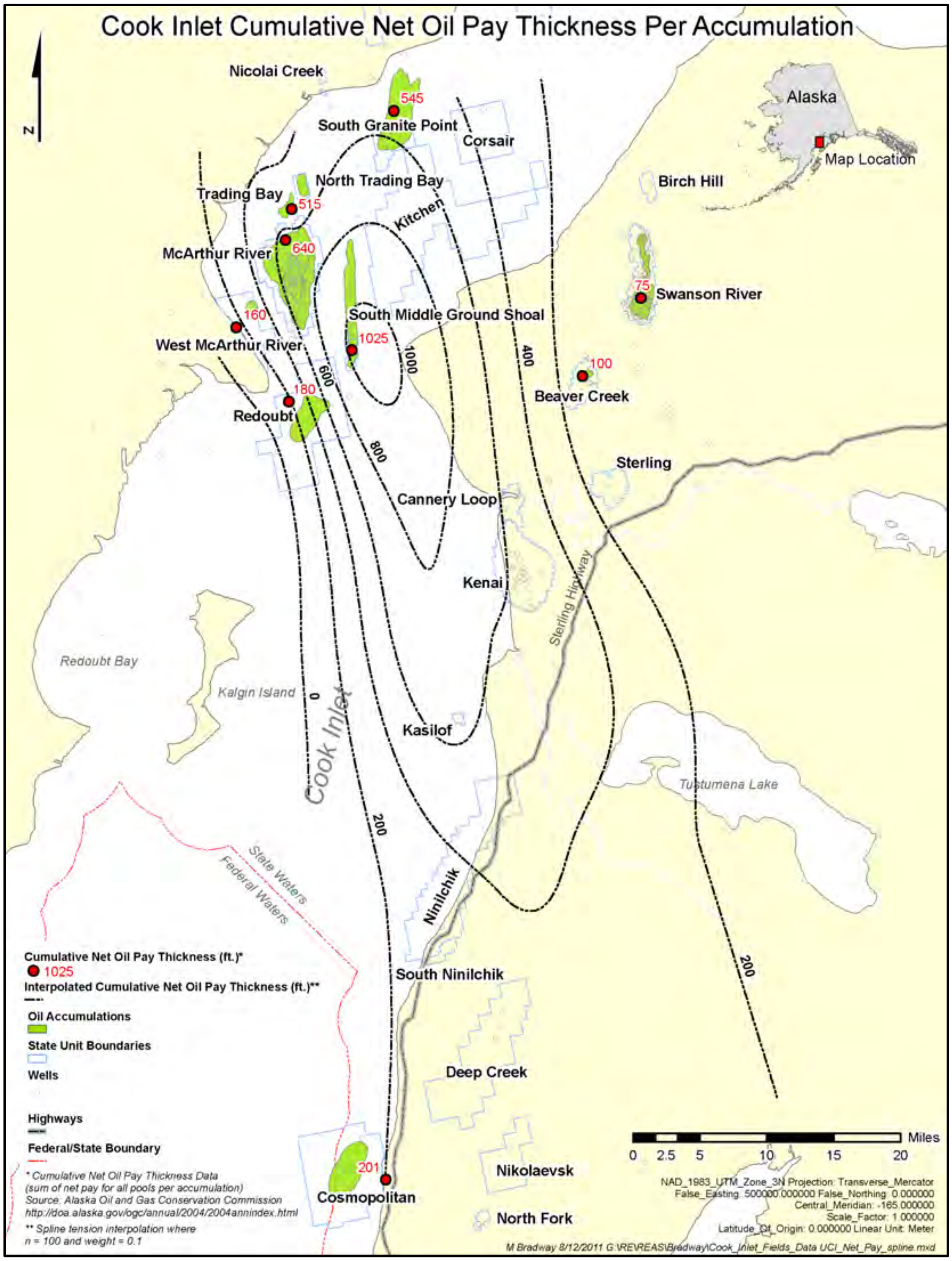

Figure B-5. Regional Map for Thicknesses of "Pay" (Oil-Bearing Sandstones). *Data for oil fields in northern Cook Inlet basin and the thickness adopted for modeling an uncontrolled oil discharge at Cosmopolitan field.*

Table B-3. Cook Inlet Oil Fields, Hemlock Kenai Group, Pay Thicknesses *

Oil Field (Pool)	Gross Pay Thickness (ft)	Net Pay Thickness (ft)	Net Pay Thickness (ft) and Midpoint of Ranged Net Pay Thickness (ft)
Granite Point (Hemlock Undefined Oil)	380	120	120
McArthur River (Middle Kenai Oil) **	250-600	250-600	425
McArthur River (Hemlock Oil)	NR	290	290
McArthur River (Middle Kenai G Oil)	NR	100	100
McArthur River (Undefined Oil)	NR	150	150
Middle Ground Shoal ("A")	NR	190	190
Middle Ground Shoal ("B", "C", and "D")	NR	335	335
Middle Ground Shoal ("E", "F", and "G")	NR	500	500
Redoubt Shoal (Undefined Oil)	675	180-450	315
Swanson River (Hemlock Oil)	NR	70-220	145
Trading Bay (G NE Hemlock NE)	400	215	215
Trading Bay (Hemlock Oil)	NR	300	300
Trading Bay (Middle Kenai "B" Oil)	NR	NR	NR
Trading Bay (Middle Kenai "C" Oil)	NR	NR	NR
Trading Bay (Middle Kenai "D" Oil)	NR	NR	NR
Trading Bay (Middle Kenai "E" Oil)	NR	NR	NR
Trading Bay (Undefined Oil)	NR	NR	NR
West McArthur River (Oil)	290	160	160
	Average Net Pay (13 Pools)=		***250***

Notes: * as reported by the Alaska Oil and Gas Conservation Commission at web page for 2004 and 2005 pool statistics at http://doa.alaska.gov/ogc/annual/annindex.html (accessed 24 apr'15)
** "Middle Kenai Group" refers to lower Tyonek Formation and Upper Hemlock Formation in some fields

Table B-2 reports initial water saturation values (Swi) for several Hemlock-Kenai Group reservoirs in Cook Inlet oil fields. The average of the reported Swi values is 0.37 and this value was adopted for the model for the Cook Inlet VLOS well.

The oil discharged from the Cook Inlet VLOS well is assumed to be 23.2° API crude oil on the basis of PVT studies of oil produced during tests at the Hansen 1 and Hansen 1A wells (AOGCC, 2005; AOGCC, 2010). The Starichkof State 1 well recovered 20° API oil in an emulsion with water and sediment from the upper part of the Starichkof sandstones. The oil was separated by centrifuge at Core lab and determined to be 24° API (Core Laboratory, 1967). A regional map of oil gravity for Cook Inlet oil fields in reservoirs correlative to the Cosmopolitan reservoir(s) is presented for regional context in Figure B-6.

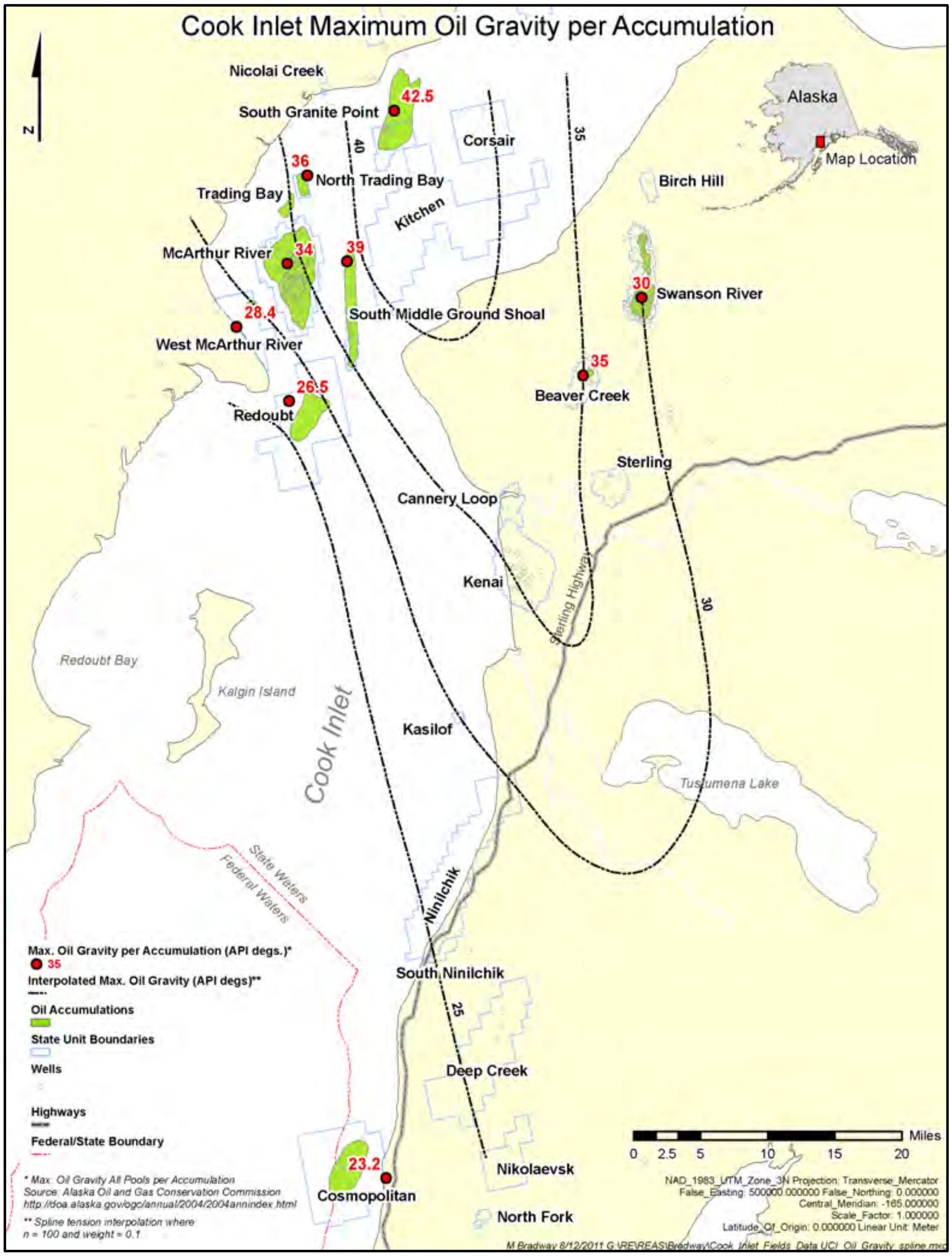

Figure B-6. Distribution of Oil Gravity in Tertiary-Age Reservoirs (*Commercial Oil Fields in Northern Cook Inlet and the Cosmopolitan Field). Overall, oil gravity declines in the southern and western parts of the Cook Inlet geologic basin.*

Like most Cook Inlet oils, the Cosmopolitan oil appears to be under-saturated[7], apparently a function of low gas yields from the Middle Jurassic Tuxedni Group oil source beds as a function of modest

[7] *"Under-saturated" refers to a condition in which the oil contains less natural gas in solution than the maximum possible at the* in situ *reservoir pressure and temperature conditions. As reservoir pressure declines with extraction of under-saturated oil, a "bubble point" is reached and gas leaves solution to form a free gas phase (bubbles) in the reservoir. In oil fields with a gas cap, the oil is generally found to be "saturated" with respect to the maximum possible content of dissolved natural gas.*

thermal exposure[8]. A gas-oil ratio (GOR) of *421 standard cubic ft/stock-tank-bbl oil (scf/stbbl) was adopted for the WCD model for the Cook Inlet VLOS well.* This value is based on PVT studies of oil produced during long-term tests at the Hansen 1A sidetrack well (AOGCC, 2010). Reported GOR values of the 4 oil samples range from 389 to 426 scf/stb. Sample SSB 11879-QA, obtained from the upper Hemlock sequence at 18,976 ft md bkb, has an OBM-corrected GOR of 421 scf/stb and was selected as the model oil for the VLOS model because the laboratory PVT test pressure and temperature is exactly the same as the pressure and temperature estimated at the midpoint of the oil-bearing reservoir sequence (combined Starichkof and Hemlock sequences) at the VLOS well. GOR values from other data sets range widely. Three tests of Hemlock conglomerates and one test of the Starichkof sandstones were conducted in the Hansen 1 well (AOGCC, 2005). Two Hemlock oil tests reported GOR values of 115 and 197 scf/stbbl. The Starichkof (identified as "Tyonek") oil test reported a GOR of 200 scf/stbbl.

Assuming the VLOS model reservoir temperature, pressure, specific gas gravity, and oil gravity (138°F, 3,046 psi, 0.66 (air=1), and 23.2° API, respectively), the GOR at saturation is estimated to be 474 scf/stbbl. The under-saturation of the oil leads to higher oil viscosity in the reservoir and thus a moderating role in limiting discharge rates.

A bubble-point pressure is estimated at 2,257 psia based upon PVT studies of oil produced during long-term tests at the Hansen 1A sidetrack well. Reported bubble-point pressures for 4 samples from these tests ranged from 2,257 to 2,484 psia. The sample with an estimated bubble-point pressure of 2,257 psia was selected as the model oil for the VLOS model because the laboratory PVT test pressure and temperature is exactly the same as the VLOS model pressure and temperature at the midpoint of the oil-bearing reservoir sequence (combined Starichkof and Hemlock sequences) at the VLOS well.

The oil viscosity at reservoir temperature and pressure is estimated to be 2.825 centipoise (cP) based upon PVT studies of oil produced during long-term tests at the Hansen 1A well (AOGCC, 2010). Reported viscosity values for 2 of 4 samples from these tests ranged from 2.825 to 3.603 cP. The value of 2.825 cP was selected as the model oil viscosity because the laboratory PVT test pressure and temperature is exactly the same as the pressure and temperature at the midpoint of the oil-bearing reservoir sequence (combined Starichkof and Hemlock sequences). The same PVT study produced an estimate of bubble-point viscosity of 2.66 cP. Other oil viscosity studies generally show values much higher than 2.825 cP. Oil samples recovered (and centrifuged from an oil-water emulsion) from the Pennzoil Starichkof State 1 well were subjected to a series of viscosity measurements at 130°F and varying pressures after recombination with methane at a ratio of 75 scf/stbbl. At 130°F, approaching the reservoir temperature of 138°F, the reported viscosity of this under-saturated oil is 17.7 cP. As acknowledged in the Darcy radial-flow equation above, high viscosity exerts a powerful effect upon discharge rate. Adoption of an oil viscosity of 17.7 cP achieves a reduction of flow rate to 16% (2.825*100/17.7) of the rate obtained with an oil viscosity of 2.825 cP). Viscosity data for commercial oil fields in northern Cook Inlet are listed in Table B-3. For context, a regional map of oil viscosity data for reservoirs correlative to the Starichkof and Hemlock sandstones is shown in Figure B-7.

[8] *With exposure to high temperatures, source rocks generally first generate and expel oil which contains very little gas. With sufficient increase in temperature, oil expulsion is generally followed by gas expulsion or cracking of the oil to gas and increasing solution gas-oil ratios for the oil.*

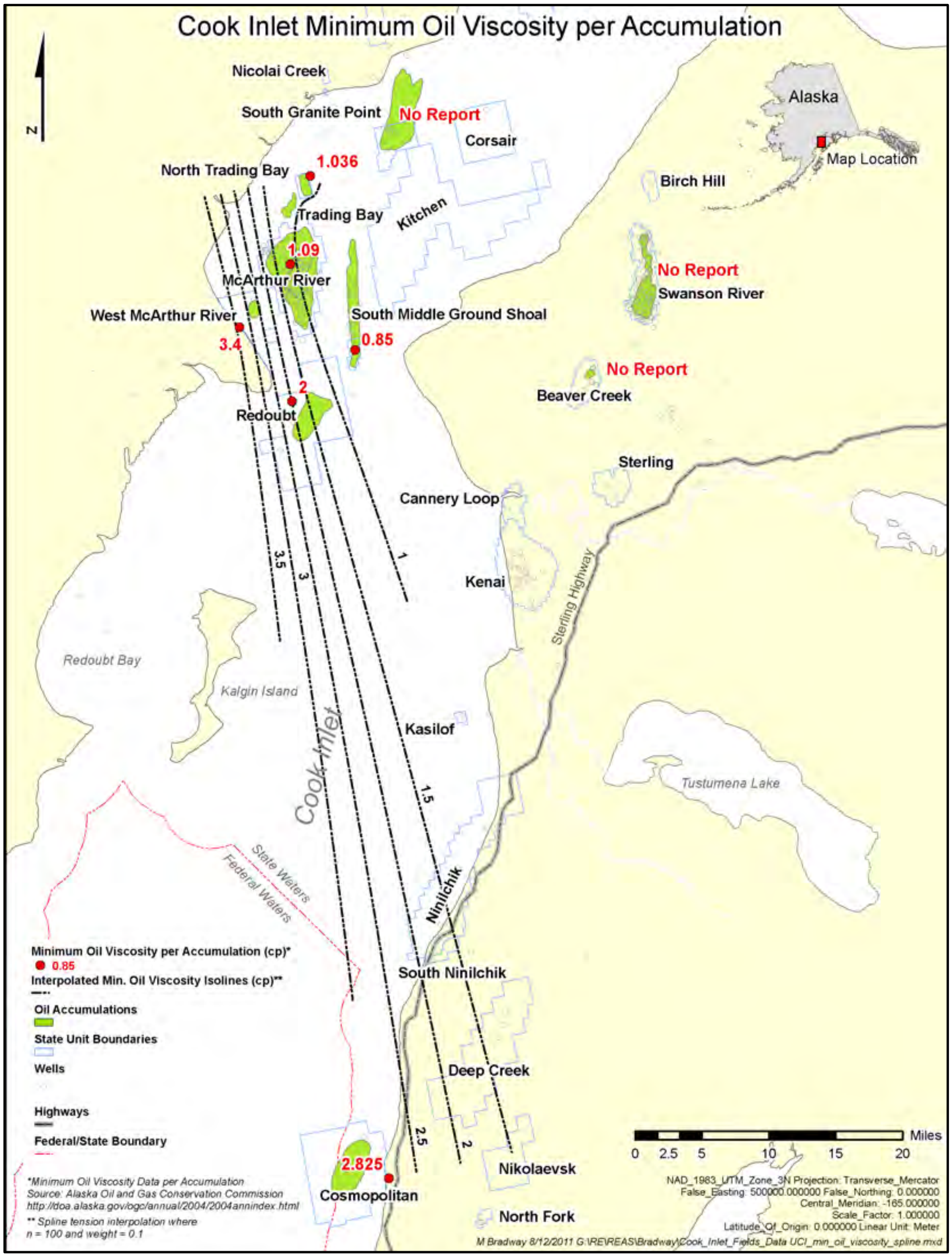

Figure B-7. Distribution of oil viscosity in Tertiary-age reservoirs in commercial oil fields (northern Cook Inlet and the Cosmopolitan field). *Overall, oil viscosity rises as oil gravity declines in the southern and western parts of the Cook Inlet geologic basin.*

B-6. BOEM Mechanical and Reservoir Design Models for the Cook Inlet VLOS Well

The casing plan for the Cook Inlet VLOS well is modeled on the casing programs used at the vertical Pennzoil Starichkof State 1 and Starichkof State-Unit 1 wells drilled in State waters by Pennzoil in 1967. Casing strings 20-inches, 13-3/8-inches, and 9-5/8-inches in outer diameter are assumed to be nested and reach to the wellhead at the base of the blowout preventer under the drill floor. The inner-most casing string, the 9-5/8-inch (outer-diameter) string with an interior diameter of 8.535 inches (radius, 0.356 ft), extends from the top of the oil-bearing Starichkof sandstone sequence (exact depth proprietary) to the base of the blowout preventer and forms the main part of the flow path during the discharge. For modeling purposes, the 9-5/8-inch string is assumed to extend through the blowout preventer to the Kelly bushing. Interior roughness of the 9-5/8-inch casing string is defaulted to 0.0018 inches for purposes of estimating frictional effects.

The lower part of the discharge flow path is the open wellbore through the oil-bearing reservoir sandstones. The drilled diameter of the open-hole is 8-1/2 inches but the hole is assumed to be enlarged to 9-1/2-inches (radius, 0.396 ft) consistent with the caliper on the sonic log in the Pennzoil Starichkof State Unit 1 well in the section just above the target formations, which shows a section drilled with an 8-3/4-inch bit typically enlarged to 9.5 to 10 inches. The open-hole diameter ranges over 1.6 inches from extremes of 8.9 to 10.5 inches in the interval from 6,000-6,900 ft bkb in the Pennzoil Starichkof State-Unit well. Interior roughness of the 9-1/2-inch open hole in the VLOS well is defaulted to 0.10 inches for purposes of estimating frictional effects.

The reservoir model for the *MERLIN* simulation of the Cook Inlet VLOS well was constructed for an assumed 25,000 acre reservoir field assuming a vertical-well-spacing of ~200 acres for development. To simulate this field a 21 cell by 21 cell (total 441 cells) Cartesian grid system of varying dimensions was designed with the producing well located at the center of this grid. This grid system utilizes smaller cells centered around the location of the VLOS well and surrounded by progressively larger cells in outlying grids, as shown in Figure B-8.

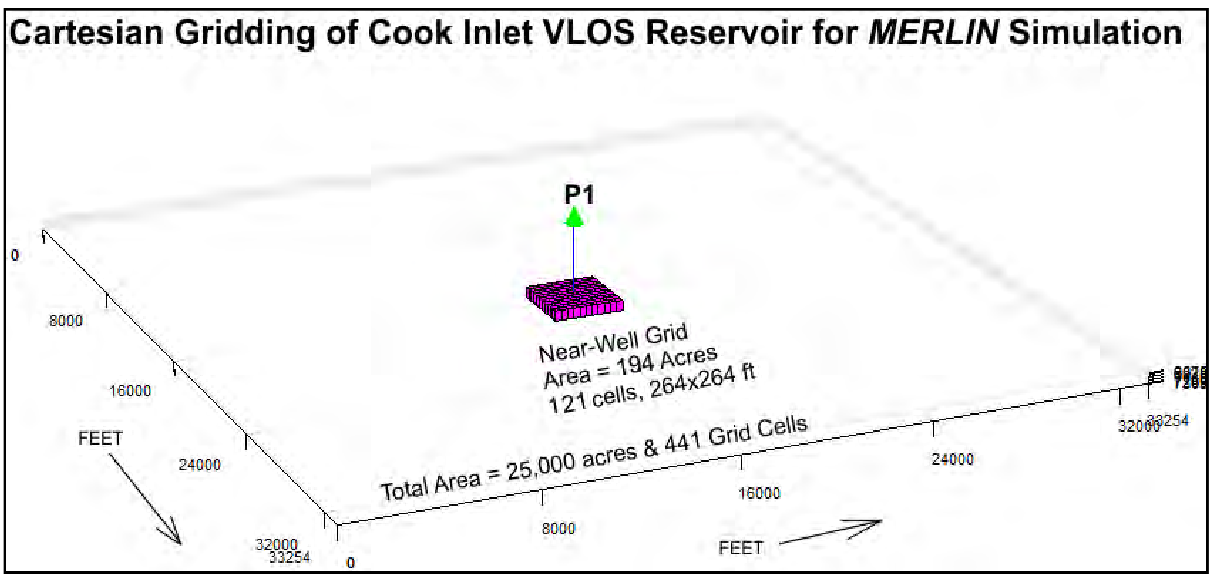

Figure B-8. Perspective of elements of Cartesian grid for worst-case discharge simulation at the Cook Inlet VLOS well. *Well is located at the Cosmopolitan oil field near Anchor Point, Alaska. "P1" is the VLOS well at the center of the detailed near-well 194-acre grid consisting of 121 cells, each 264 ft on a side. The gridded volume is ~200 ft thick. Cell dimensions progressively increase to a maximum of 7,830x7,830 ft per cell at distance from the "P1" well (intermediate cells outside of 264x264-ft cell grid around P1 not shown).*

The near-well grid was designed around cells 264 ft on a side based upon a well spacing of 194 acres (8,433,216 ft^2 divided into a 11x11-cell grid consisting of 121 cells). Outside the near-well grid, cell dimensions are then increased in an approximately geometric progression until the 25,000 reservoir area is met. The grid sizing utilized in the model is based upon the following Cartesian cell dimensions: 264'x264', 489'x489', 980'x980', 1960'x1960', 3916'x3916', and 7830'x7830'. The

Cook Inlet VLOS well was also independently modeled with a radial configuration consisting of a system of concentric bands centered on the well and increasing in radial thickness at distance from the well. The radial simulation model yielded results similar to the Cartesian model, with a slightly lower day 1 oil discharge rate than the Cartesian model (2,032 stbbls/d versus 2,135 stbbls/d for the Cartesian model).

B-7. Worst-Case-Discharge Modeling Results

A comprehensive discharge schedule for the Cook Inlet VLOS well over a 100-day period is reported in Tables B-4 and B-5. Figure B-9 provides a chart that illustrates the discharge patterns over time for selected elements of tables B-4 and B-5.

Following initiation of the blowout, the oil discharge from the Cook Inlet VLOS well aggregates to 2,135 stbbls over the course of day 1 (first 24 hours). This includes filling the volume of an empty wellbore with produced oil and gas (Pwf=0 psia at time=0). After peaking in day 1, Figure B-9 shows that the oil discharge rate in the *BOEM* model declines abruptly (overall, -4.8% per day[9]) through the first 4 days of flow, then moderately (overall, 0.7% per day) from day 4 to day 15, and thereafter declining very slowly (overall, 0.2% per day) out to 100 days. The overall annualized oil discharge decline rate over 100 days is approximately 82%/year.

Gas in proportion to oil (reservoir GOR=421 scf/stbbl) is also discharged. Because reservoir pressure does not fall below the bubble point (2,257 psia) during the flow period, the producing GOR remains constant at 421 scf/stbbl (tbls. B-4, B-5). Water discharge is negligible and is rounded to zero in tables B-4 and B-5. After the wellbore is filled, the flowing bottom-hole pressure remains constant at 1,594 psia throughout the 100 days of flow.

Some key timelines and cumulative oil discharge estimates follow (also listed in tbls. B-4 and B-5):

- The day 1 aggregate discharge or "worst-case" rate is 2,135 stbbls/d.
- At the end of day 30, the cumulative oil discharge reported for the Cook Inlet VLOS well model is 48,989 bbls. The oil discharge rate by day 30 has fallen to 1,525 stbbls/day.
- The minimum time required to arrest the blowout[10] is estimated to be 50 days (BOEM, 2012). At the end of day 50, the cumulative oil discharge reported by the VLOS model is 78,830 stbbls. The oil discharge rate at day 50 is 1,464 stbbls/day.
- The maximum time required to arrest the blowout[9] is estimated to be 80 days (BOEM, 2012). At the end of day 80, the cumulative oil discharge reported by the VLOS model is 121,467 stbbls. The oil discharge rate at day 80 is 1,382 stbbls/day.

Also shown in Tables B-4 and B-5 are the substantial cumulative gas discharges from the Cook Inlet VLOS well. At the end of day 30, the cumulative gas discharge is $20,624 \times 10^3$ standard[11] cubic feet (by convention reported as 20,624 Mscf). At the end of day 50, the cumulative gas discharge is 33,187 Mscf. At the end of day 80, the cumulative gas discharge reported for the Cook Inlet VLOS model is 51,138 Mscf.

[9] *Calculated as: Decline (fraction per day) = [(final rate/initial rate)^(1/number of days)] - 1*

[10] *Includes the time required to mobilize the relief well rig, to drill the relief well, and to intersect the blowout wellbore and to stop the uncontrolled flow.*

[11] *"Standard" refers to volume measurement at defined standard conditions--60°F and 1 atmosphere (14.73 psia).*

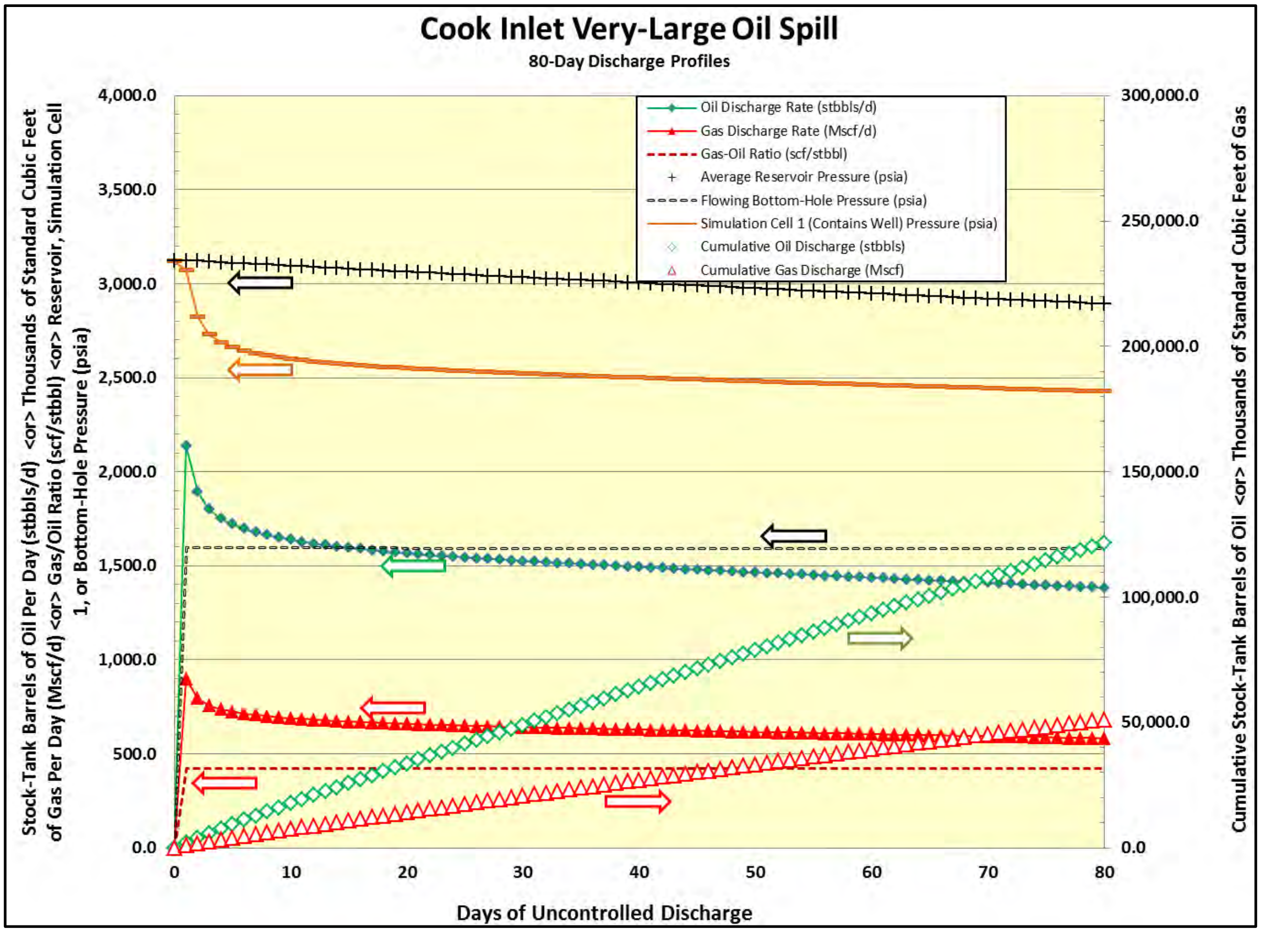

Figure B-9. Time-progression of oil (green symbols) and gas (red symbols) discharges over 100 days from the hypothetical Cook Inlet VLOS well *(Cosmopolitan oil field in southern Cook Inlet basin, Alaska). Oil and gas discharge rates are scaled at left; cumulative discharges are scaled at right. Flowing bottom-hole (within the wellbore at the reservoir depth) pressure is constant at 1,594 psia and producing gas-oil ratio is constant at 421 scf/stbbl. Declines in average reservoir pressure and cell 1 (cell containing the VLOS well) are also displayed.*

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B-9. Uncontrolled Discharge Table

Table B-4. VLOS - Uncontrolled Discharge from a Single Exploration Well - Days 1-80.

Discharge Day	Oil Discharge Rate (STB/d)	Gas Discharge Rate (MSCF/d)	Water Discharge Rate (STB/d)	Producing Gas-Oil Ratio (SCF/STB)	Cumulative Oil Discharge (STB)	Cumulative Gas Discharge (MSCF)	Average Reservoir Pressure (psia)	Flowing Bottom-Hole Pressure (psia) at Midpoint of Reservoir	Reservoir Pressure in Simulation Cell Containing Wellbore (psia)
0	0	0	0	0	0	0	3,120	0	3,120
1	2,135	899	0	421	2,135	899	3,120	1,594	3,072
2	1,891	796	0	421	4,026	1,695	3,120	1,594	2,824
3	1,800	758	0	421	5,826	2,453	3,116	1,594	2,730
4	1,752	738	0	421	7,578	3,191	3,113	1,594	2,688
5	1,721	724	0	421	9,299	3,915	3,109	1,594	2,662
6	1,697	714	0	421	10,996	4,629	3,106	1,594	2,644
7	1,678	707	0	421	12,674	5,336	3,103	1,594	2,630
8	1,663	700	0	421	14,337	6,036	3,100	1,594	2,618
9	1,650	694	0	421	15,987	6,730	3,096	1,594	2,609
10	1,638	689	0	421	17,625	7,419	3,093	1,594	2,600
11	1,627	685	0	421	19,252	8,104	3,090	1,594	2,593
12	1,618	681	0	421	20,870	8,785	3,087	1,594	2,587
13	1,610	678	0	421	22,480	9,463	3,084	1,594	2,581
14	1,603	675	0	421	24,083	10,138	3,081	1,594	2,575
15	1,596	672	0	421	25,679	10,810	3,078	1,594	2,570
16	1,589	669	0	421	27,268	11,479	3,074	1,594	2,566
17	1,583	667	0	421	28,851	12,146	3,071	1,594	2,562
18	1,576	664	0	421	30,427	12,810	3,068	1,594	2,558
19	1,571	661	0	421	31,998	13,471	3,065	1,594	2,554
20	1,566	659	0	421	33,564	14,130	3,062	1,594	2,551
21	1,561	657	0	421	35,125	14,787	3,059	1,594	2,547
22	1,557	655	0	421	36,682	15,442	3,056	1,594	2,544
23	1,552	654	0	421	38,234	16,096	3,053	1,594	2,541
24	1,548	652	0	421	39,782	16,748	3,050	1,594	2,538
25	1,544	650	0	421	41,326	17,398	3,047	1,594	2,535
26	1,540	648	0	421	42,866	18,046	3,044	1,594	2,533
27	1,536	647	0	421	44,402	18,693	3,041	1,594	2,530
28	1,533	645	0	421	45,935	19,338	3,038	1,594	2,527
29	1,529	644	0	421	47,464	19,982	3,035	1,594	2,525
30	1,525	642	0	421	48,989	20,624	3,032	1,594	2,522
31	1,522	641	0	421	50,511	21,265	3,029	1,594	2,520
32	1,519	639	0	421	52,030	21,904	3,026	1,594	2,518
33	1,515	638	0	421	53,545	22,542	3,024	1,594	2,516
34	1,512	637	0	421	55,057	23,179	3,021	1,594	2,513
35	1,509	635	0	421	56,566	23,814	3,018	1,594	2,511
36	1,506	634	0	421	58,072	24,448	3,015	1,594	2,509
37	1,502	632	0	421	59,574	25,080	3,012	1,594	2,507
38	1,499	631	0	421	61,073	25,711	3,009	1,594	2,505
39	1,496	630	0	421	62,569	26,341	3,006	1,594	2,503
40	1,493	629	0	421	64,062	26,970	3,003	1,594	2,501
41	1,490	627	0	421	65,552	27,597	3,000	1,594	2,499
42	1,487	626	0	421	67,039	28,223	2,997	1,594	2,497
43	1,484	625	0	421	68,523	28,848	2,994	1,594	2,495
44	1,481	624	0	421	70,004	29,472	2,992	1,594	2,493
45	1,478	622	0	421	71,482	30,094	2,989	1,594	2,491
46	1,475	621	0	421	72,957	30,715	2,986	1,594	2,489

Discharge Day	Oil Discharge Rate (STB/d)	Gas Discharge Rate (MSCF/d)	Water Discharge Rate (STB/d)	Producing Gas-Oil Ratio (SCF/STB)	Cumulative Oil Discharge (STB)	Cumulative Gas Discharge (MSCF)	Average Reservoir Pressure (psia)	Flowing Bottom-Hole Pressure (psia) at Midpoint of Reservoir	Reservoir Pressure in Simulation Cell Containing Wellbore (psia)
47	1,472	620	0	421	74,429	31,335	2,983	1,594	2,487
48	1,470	619	0	421	75,899	31,954	2,980	1,594	2,485
49	1,467	617	0	421	77,366	32,571	2,977	1,594	2,483
50	1,464	616	0	421	78,830	33,187	2,974	1,594	2,481
51	1,461	615	0	421	80,291	33,802	2,972	1,594	2,479
52	1,458	614	0	421	81,749	34,416	2,969	1,594	2,477
53	1,455	613	0	421	83,204	35,029	2,966	1,594	2,476
54	1,453	612	0	421	84,657	35,641	2,963	1,594	2,474
55	1,450	610	0	421	86,107	36,251	2,960	1,594	2,472
56	1,447	609	0	421	87,554	36,860	2,958	1,594	2,470
57	1,444	608	0	421	88,998	37,468	2,955	1,594	2,468
58	1,441	607	0	421	90,439	38,075	2,952	1,594	2,466
59	1,439	606	0	421	91,878	38,681	2,949	1,594	2,465
60	1,436	605	0	421	93,314	39,286	2,946	1,594	2,463
61	1,433	603	0	421	94,747	39,889	2,944	1,594	2,461
62	1,430	602	0	421	96,177	40,491	2,941	1,594	2,459
63	1,428	601	0	421	97,605	41,092	2,938	1,594	2,457
64	1,425	600	0	421	99,030	41,692	2,935	1,594	2,456
65	1,422	599	0	421	100,452	42,291	2,932	1,594	2,454
66	1,420	598	0	421	101,872	42,889	2,930	1,594	2,452
67	1,417	597	0	421	103,289	43,486	2,927	1,594	2,450
68	1,414	595	0	421	104,703	44,081	2,924	1,594	2,449
69	1,412	594	0	421	106,115	44,675	2,921	1,594	2,447
70	1,409	593	0	421	107,524	45,268	2,919	1,594	2,445
71	1,406	592	0	421	108,930	45,860	2,916	1,594	2,443
72	1,404	591	0	421	110,334	46,451	2,913	1,594	2,441
73	1,401	590	0	421	111,735	47,041	2,911	1,594	2,440
74	1,398	589	0	421	113,133	47,630	2,908	1,594	2,438
75	1,396	588	0	421	114,529	48,218	2,905	1,594	2,436
76	1,393	586	0	421	115,922	48,804	2,902	1,594	2,435
77	1,390	585	0	421	117,312	49,389	2,900	1,594	2,433
78	1,388	584	0	421	118,700	49,973	2,897	1,594	2,431
79	1,385	583	0	421	120,085	50,556	2,894	1,594	2,429
80	1,382	582	0	421	121,467	51,138	2,892	1,594	2,428

Notes: Cartesian grid model 25,000 acre reservoir field with ~200 acre development pattern/spacing, field summary table from Merlin-Avalon simulation.

Relief well mobilized to blowout site, drills relief well, and gains control of blowout well by day 50 (estimate of minimum time required) or day 80 (estimate of maximum time required).

STB/d, stock-tank (surface) barrels per day; MSCF/d, thousands of standard (surface conditions, or 60°F and 1 atmosphere (14.73 psia) cubic feet of gas; psia, pounds per square inch, absolute.

APPENDIX C

Air Quality Modeling For Lease Sale 244

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Appendix C. Air Quality Modeling

C-1. Table of Contents

C-2. List of Figures

C-3. List of Tables

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Air Quality Modeling

C-1. Introduction

Outer Continental Shelf (OCS) oil and gas exploration and development activities result in emissions of nitrogen oxides (NO_X), sulfur dioxide (SO_2), carbon monoxide (CO), particulate matter (PM), lead (Pb), and can contribute to the formation of ozone (O_3). The U.S. Environmental Protection Agency (EPA) sets National Ambient Air Quality Standards (NAAQS) for these pollutants to provide for the protection of public health and the environment. The Clean Air Act, as amended (42 U.S.C. §§ 7470 to 7479) also establishes a program for the Prevention of Significant Deterioration (PSD) designed to set limits to the amount of air quality degradation from new and modified emission sources in special geographical areas that historically maintain good air quality, referred to as Class I areas (national parks and wilderness areas) and Class II areas (national preserves, recreation areas, and national monuments). The PSD program sets maximum allowable increases in pollutant concentrations, relative to the baseline levels, for concentrations of NO_2, SO_2, and PM. These limits are most restrictive in areas designated as Class I areas and are the responsibility of the state Federal Land Manager (FLM).

The assessment of potential air quality impacts under the National Environmental Policy Act (NEPA) requires the analysis and evaluation of projected air emissions when applied to computer-simulated dispersion modeling. Dispersion modeling results due to the proposed action and each of its alternatives are compared to the NAAQS to determine compliance to the relevant sections of the Clean Air Act (as amended). Air quality simulation modeling can also illustrate potential impacts to visibility, one of the Air Quality Related Values (AQRVs) which the FLM is responsible for protecting.

Air quality modeling was performed using Offshore and Coastal Dispersion (OCD5) model (https://www3.epa.gov/ttn/scram/dispersion_prefrec.htm#ocd) to assess potential air quality impacts from OCS oil and gas development associated with Proposed Lease Sale 244 and the air quality modeling study area (Figure C-1) in Cook Inlet in the Alaska Region on the Tuxedni Wilderness, Alaska Maritime National Wildlife Refuge. Emission scenarios were developed based on projected exploration and production activities. The modeling emphasized possible impacts on the Tuxedni Wilderness, Alaska Maritime National Wildlife Refuge, a PSD Class I area under the Clean Air Act located on Chisik Island west and inshore of the proposed Lease Area. The modeling showed that the highest concentrations of NO_2, SO_2, and PM_{10} would occur in close proximity to and oil and gas facility in the proposed Lease Area, i.e., an exploration rig or production platform. The modeled concentrations decrease rapidly with distance. Projected concentrations within Tuxedni Wilderness, Alaska Maritime National Wildlife Refuge were well within the PSD Class I maximum allowable increases. If the projected concentrations from a proposed facility exceed the Class I Significance Levels, a comprehensive PSD increment consumption analysis would need to be conducted by the permit applicant. Within the Tuxedni Wilderness, Alaska Maritime National Wildlife Refuge, the modeled annual average NO_2, maximum 24-hour and 3-hour SO_2, and the maximum 24-hour and annual PM_{10} values exceed the Class I significance levels for the exploration scenario. The production scenario also results in exceedances of significance levels for annual average NO_2 concentrations and the Max 24-hr PM_{10} within Tuxedni Wilderness, Alaska Maritime National Wildlife Refuge. Visibility screening using VISCREEN (https://www3.epa.gov/scram001/dispersion_screening.htm#viscreen) indicated that a plume from an exploration or production facility near Tuxedni Wilderness, Alaska Maritime National Wildlife Refuge could be visible under the most restrictive meteorological conditions (up to about 50 km from the Tuxedni Wilderness, Alaska Maritime National Wildlife Refuge). The plume would most likely not be visible under average meteorological conditions, but more rigorous analyses would be needed to more precisely evaluate any effects.

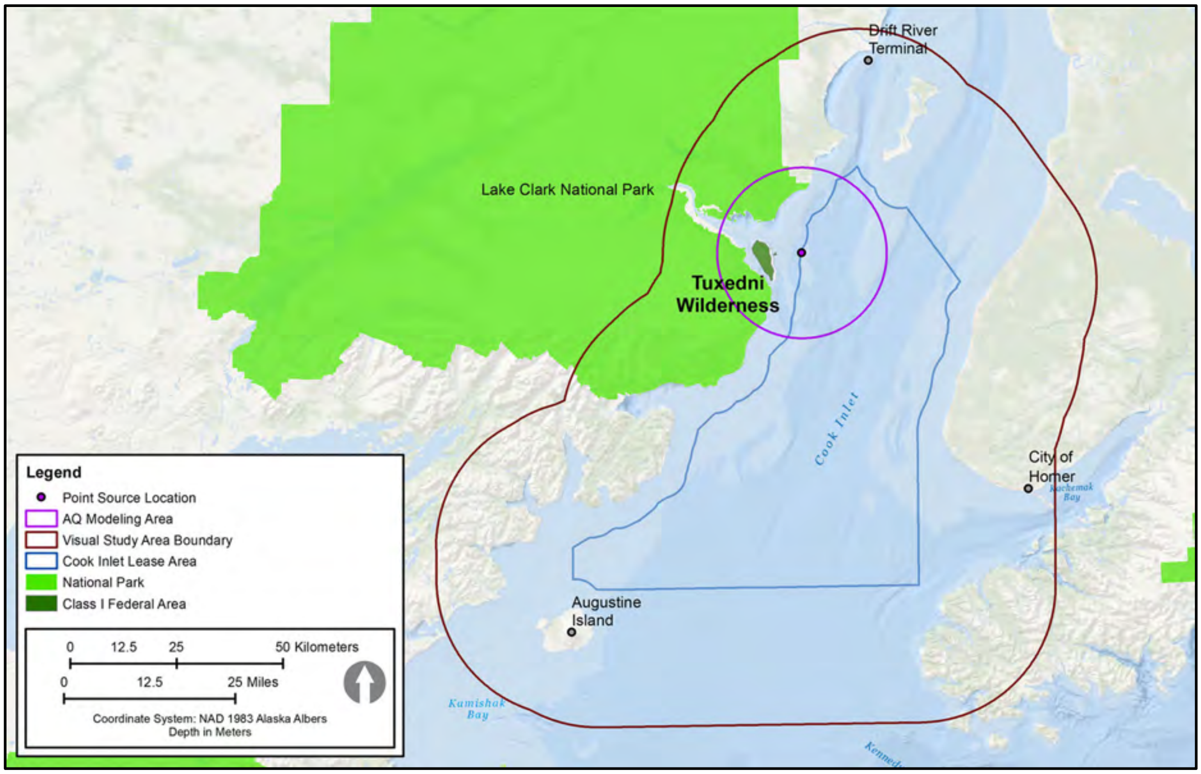

Figure C-1. Air Quality Modeling Study Area.

C-2. Existing Air Quality

Information on air emissions in the area may be obtained from an EPA database (http://dec.alaska.gov/Applications/Air/airtoolsweb/PointSourceEmissionInventory). Industrial emissions on the Kenai Peninsula primarily arise from gas processing, oil refining, power generation, and petrochemical production. Other emissions result from motor vehicles (highway and off-highway activities). Vessel traffic in Cook Inlet is also a significant source of emissions. In Anchorage, the largest emissions are attributed to motor vehicles. Off-highway vehicular sources also contribute a significant fraction of the total emissions. Industrial sources consist mainly of power generation and refuse burning facilities.

The air quality monitoring stations nearest the project area are limited to the Anchorage urban center. Measurements have shown that pollutant levels are well within the NAAQS. The Anchorage municipality was in nonattainment for CO (1971 standard) as recently as 2003 and for PM_{10} (1987 standard) as recently as 2012, but has since been redesignated an attainment area and operates under a maintenance program. No other NAAQS violations have occurred since 2012. Ambient levels of pollutants in the remainder of the project area are presumed by EPA to be well within the NAAQS.

C-3. Climate

The climate of the Cook Inlet is characterized by cold winters and cool summers. Temperatures are moderated by the marine influences from the inlet and the Gulf of Alaska waters to the south. At Homer, Alaska the average maximum and minimum temperatures in January are around -1°C and -10°C, respectively. In July, the average maximum temperature is around 15°C, while the minimum is around 9°C. Precipitation is distributed fairly evenly throughout the year, but tends to be highest in the fall and lowest in the spring. Winds are strongly channeled by the surrounding high topography and tend to blow along the length of the Cook Inlet, except in areas where there are gaps in the mountain ranges.

C-4. Lease Sale 244 Exploration and Development Scenario

It was assumed that for this proposed lease sale, approximately 215 million barrels of oil and up to 571 billion cubic feet of gas would be discovered and produced from a single development project (Section 2.4.1). Exploration would peak between the years 2018 and 2021 with the drilling of seven to ten exploration/delineation wells. This would be followed by the installation of two to three production platforms in the years 2023 to 2026, and 55 to 66 production wells between 2023 and 2029. Oil and gas production would peak in the years 2025 through 2027 with a maximum daily production of 68,000 barrels of oil and 181 million cubic feet of gas.

C-5. Development of Emission Scenario

Exploration and delineation wells could be carried from a semisubmersible or a jack-up rig, or similar type of bottom-founded unit. For this analysis it was assumed that drilling would take place from a bottom founded drilling unit. The equipment inventory, power requirements, and duration were based on information from a permit application for the Shell Beaufort Sea Alaska Exploratory Drilling Program (USDOI, BOEMRE, 2011). The primary emission sources were the main diesel engines, emergency generator, deck cranes, incinerators, and support vessels.

Emissions for a production platform were calculated based on the most recent emissions inventory of Cook Inlet Energy's Osprey Platform. It was assumed that the primary emissions sources on the platform would be the drilling engines, emergency generators, deck cranes, heaters and boilers, test flare, and support vessels.

C-6. Meteorological Data

The OCD5 model requires offshore meteorological data, onshore surface data, and onshore radiosonde data. There are no meteorological buoys in Cook Inlet; however, there are two C-MAN (Coastal-Marine Automated Network) stations. The Drift River Terminal (DRFA2) station is located just to the north of the proposed lease sale area, while the Augustine Island (AUGA2) site is near the west-central boundary of the lease area. A National Weather Service (NWS) surface observation station is located at Homer. Wind roses were constructed to compare the wind climatology from the three stations. At DRFA2 the winds are primarily from the north and north-northwest, with a secondary maximum from the south. It is very evident that the winds are channeled strongly by the surrounding topography. At AUGA2 the most frequent wind directions are from the northeast, west and west-northwest. The westerly winds are the result of a gap in the topography to the west of the island. At the Homer site, the most frequent wind directions are from the northeast and north-northeast. There also is a secondary maximum for winds from the west-southwest. The winds are again strongly influenced by the topography as they are mainly aligned along the length of the Kachemak Bay. The frequency distribution of wind direction in the Cook Inlet therefore varies by location. For the area around Tuxedni Island, winds will tend to be similar to those observed at DRFA2 with prevailing northerly directions. This would result in a low frequency of occurrence of direct transport of pollutants to Tuxedni Wilderness, Alaska Maritime National Wildlife Refuge, and hence the overall impacts. However, the winds at Homer were selected to use in the modeling as a longer term record is available for this site. The calculated pollutant concentrations would be less conservative because a larger percentage of northeasterly winds occur in that dataset.

Since no sea surface temperature observations are taken at the two C-MAN stations, certain values for long-term averages of air-sea temperature differences were assumed. The Cook Inlet does not freeze over entirely in winter. Therefore, with air temperatures generally below freezing, one would expect the sea surface temperature to be higher than the air temperature. In the summer, the sea surface temperatures will lag behind the air temperatures, so one would expect the air temperature generally to be warmer than the sea surface temperature. For the modeling input for OCD, the air-sea temperature difference was varied by season with a lowest value of -3.0°C for December and January and a highest value of 2.0°C for July and August.

The data from the Homer NWS site were used to derive the onshore stability classification, while the upper air soundings from the Anchorage radiosonde station were used to estimate the over land mixing height values. Five years of meteorological data were used, consisting of the years 2001 through 2005. For over water, a default value of 500 m was used for the mixing height.

C-7. OCD Model Input

For the exploration phase, OCD modeling runs were made for an exploration drilling unit. For the development and production phase, modeling was performed for a production facility. Estimated emissions from support vessels were included for both facilities. In order to evaluate a worst-case impact on the Tuxedni Wilderness, Alaska Maritime National Wildlife Refuge, in each case the source was placed 6 km to the northeast of Tuxedni Wilderness, Alaska Maritime National Wildlife Refuge. In the model runs, the emission sources having similar stack parameter characteristics were grouped. For grouped sources, a single set of stack parameters was generated by a weighted average of the individual emission sources. Overwater receptors were generated using a polar grid with concentric circles ranging from 0.5 to 3.0 km from the source. A total of 31 onshore receptors were generated. Of these, 16 receptor points were placed within the Tuxedni Wilderness, Alaska Maritime National Wildlife Refuge, and the remaining ones were located just inland within the Lake Clark National Park and Reserve. Receptor elevations were estimated by examining USGS topographic maps. Separate model runs were performed for each of the PSD parameters, including the annual average NO_2; annual, 24-hour, and 3-hour average SO_2; and annual and 24-hr PM_{10} concentrations.

C-8. OCD Modeling Results

Table C-1 lists the modeling results for the exploratory drilling operations. The concentrations over water are far higher than any of the values onshore. The highest predicted concentrations were found within 0.5 km of the source (the highest average concentrations are those listed in the “Overwater” column of Table C-1). At the 3-km distance from the source, the concentrations were lower by about a factor of 10, while the highest onshore concentrations were lower by about a factor of 100.

Table C-1. OCD Modeling Results for Cook Inlet Exploration (μg/m^3).

Year	Overwater					Tuxedni Wilderness, AK Maritime Natl Wildlife Refuge					Other Onshore				
	2001	2002	2003	2004	2005	2001	2002	2003	2004	2005	2001	2002	2003	2004	2005
Annual Avg. NO_2	5.095	5.977	6.271	6.663	6.957	2.254	2.254	2.352	2.352	2.450	0.098	0.098	0.196	0.098	0.098
Annual Avg. SO_2	0.084	0.098	0.103	0.110	0.115	0.037	0.037	0.039	0.039	0.040	0.002	0.002	0.003	0.002	0.002
Max 24-hr SO_2	1.480	1.443	1.467	1.009	1.614	0.363	0.258	0.253	0.276	0.226	0.066	0.052	0.068	0.065	0.058
Max 3-hr SO_2	5.583	5.605	5.599	5.065	5.599	1.125	0.997	0.788	0.650	0.728	0.352	0.268	0.313	0.341	0.462
Annual Avg. PM_{10}	0.603	0.707	0.742	0.788	0.823	0.267	0.267	0.278	0.278	0.290	0.012	0.012	0.023	0.012	0.012
Max 24-hr PM_{10}	10.628	10.361	10.535	7.244	11.590	2.608	1.854	1.820	1.982	1.623	0.475	0.371	0.487	0.464	0.417

Note: NO_2 = nitrogen dioxide; OCD = Offshore and Coastal Dispersion; PM_{10} = particulate matter; SO_2 = sulfur dioxide.

Table C-2 lists the values of the NAAQS, PSD Class II and Class I maximum allowable increments, and the PSD Class I significance levels. The highest onshore pollutant concentrations are within the

PSD Class II and Class I maximum allowable increments. Within the Tuxedni Wilderness, Alaska Maritime National Wildlife Refuge the annual average NO_2, maximum 24-hour and 3-hour SO_2, and the maximum 24-hour and annual PM_{10} values exceed the Class I significance levels. If the projected concentrations from a proposed facility exceed the significance levels, a comprehensive PSD increment consumption analysis would need to be conducted by the permit applicant.

Table C-2. PSD Maximum Allowable Increases and Class I Significance Levels (μg/m^3).

Pollutant & Averaging Period	NAAQS	Class II	Class I	Class I Significance Level
Annual Avg. NO_2	100	25	2.5	0.1
Annual Avg. SO_2	80	29	2	0.1
Max 24-hr SO_2	365	91	5	0.2
Max 3-hr SO_2	1300	512	25	1.0
Annual Avg. PM_{10}	50	17	4	0.2
Max 24-hr PM_{10}	150	30	8	0.3

Note: NAAQS = National Ambient Air Quality Standards; NO_2 = nitrogen dioxide; PM_{10} = particulate matter; PSD = Prevention of Significant Deterioration; SO_2 = sulfur dioxide.

Table C-3 shows the modeling results for a production facility. The concentrations are significantly lower than the values for the exploration activity, mainly due to the reduced vessel activity. The highest onshore pollutant concentrations are well within the PSD Class II and Class I maximum allowable increments. The annual average NO_2 concentrations and the Max 24-hr PM_{10} within Tuxedni Wilderness, Alaska Maritime National Wildlife Refuge exceed the Class I significance levels, but the SO_2 and annual PM_{10} concentrations are below the Class I significance levels for all averaging times.

Table C-3. OCD Modeling Results for Cook Inlet Production Facility (μg/m^3).

Year	Overwater					Tuxedni Wilderness, AK Maritime Natl Wildlife Refuge					Other Onshore				
	2001	2002	2003	2004	2005	2001	2002	2003	2004	2005	2001	2002	2003	2004	2005
Annual Avg. NO_2	2.167	2.543	2.668	2.834	2.959	0.959	0.959	1.000	1.000	1.042	0.042	0.042	0.083	0.042	0.042
Annual Avg. SO_2	0.002	0.002	0.003	0.003	0.003	0.001	0.001	0.001	0.001	0.001	0.000	0.000	0.0001	0.000	0.000
Max 24-hr SO_2	0.036	0.035	0.036	0.025	0.039	0.009	0.006	0.006	0.007	0.006	0.002	0.001	0.002	0.002	0.001
Max 3-hr SO_2	0.136	0.137	0.137	0.124	0.137	0.027	0.024	0.019	0.016	0.018	0.009	0.007	0.008	0.008	0.011
Annual Avg. PM_{10}	0.186	0.218	0.229	0.243	0.254	0.082	0.082	0.086	0.086	0.090	0.004	0.004	0.007	0.004	0.004
Max 24-hr PM_{10}	3.283	3.201	3.255	2.238	3.580	0.806	0.573	0.562	0.612	0.501	0.147	0.115	0.150	0.143	0.129

Note: NAAQS = National Ambient Air Quality Standards; NO_2 = nitrogen dioxide; OCD = Offshore and Coastal Dispersion; PM_{10} = particulate matter; SO_2 = sulfur dioxide.

Air quality impacts at other possible locations near the shoreline would be similar to those projected here. Impacts to locations further inland from shore would be lower. The projected pollutant concentrations in the Tuxedni Wilderness, Alaska Maritime National Wildlife Refuge would be lower than in most other areas in the Cook Inlet because the prevailing winds would, in most cases, transport emissions away from the islands.

C-9. Cumulative Impacts

In addition to the oil and gas activities described above, there are other past, present and future actions that could generate emissions on or near the OCS. Those activities that could generate emissions within the region during the next 40-50 years include: ongoing oil and gas exploration, development, and production (onshore and in State of Alaska waters), future oil & gas exploration, development and production activities and infrastructure (onshore and in state waters), construction activities related to renewable energy and mining projects, marine transportation, harbors, ports and terminal operations, the Knik Arm Crossing Project (vicinity of Cook Inlet), submarine cable projects, dredging and marine disposal, military activities and fishing activities.

There are very few emission sources within about 50 km of the Tuxedni Wilderness, Alaska Maritime National Wildlife Refuge. The nearest significant emission sources consist of a group of industrial facilities around Kenai about 90 km to the northeast of Tuxedni. The SCREEN3 screening model was run to estimate the most conservative case impacts from those facilities to the Tuxedni Wilderness, Alaska Maritime National Wildlife Refuge. The model considered the maximum effects of the plume impinging on the terrain. For NOx, the combined maximum 24-hour average concentration from the facilities was 5.7 $\mu g/m^3$. The screening model does not yield annual average concentrations. However, annual average concentrations were estimated by applying the ratio of annual to maximum 24-hour average concentrations that was based on the OCD modeling runs for the proposed OCS activities. This ratio was found to be around 8.0. The use of this ratio yielded an annual average $N0_2$ concentration of 0.7 $\mu g/m^3$. This is comparable to the annual average $N0_2$ concentration of 0.27 $\mu g/m^3$ that was projected for the Cook Inlet OCS activities. If one combines the two values, the total concentration would be just below 1.0 $\mu g/m^3$, which is within the PSD Class I maximum allowable increment of 2.5 $\mu g/m^3$.

The maximum 24-hour PM_{10} concentration from the Kenai facilities using SCREEN3 was 0.2 $\mu g/m^3$. This is also comparable to the maximum 24-hour value of 0.5 $\mu g/m^3$ for the Cook Inlet lease sale modeling. If one combines the two concentrations, the total value is 0.7 $\mu g/m^3$, which is well within the maximum PSD Class I increment of 8 $\mu g/m^3$. The projected annual average PM_{10} concentration is 0.02 $\mu g/m^3$. The annual average PM_{10} concentration from the proposed lease sale activities was also 0.02 $\mu g/m^3$. The combined value is well within the PSD Class I allowable increment of 4 $\mu g/m^3$.

Cumulative impacts may result from any additional OCS activities in the Cook Inlet as well as contributions from oil and gas development in State waters. The additional impacts would depend on the locations of these activities with respect to those associated with the proposed lease sales. If several more OCS facilities were to be located in close proximity to the one modeled, the combined concentrations would still be within the PSD Class I limits. In reality, facilities would most likely be spread in different locations, and the combined effects would not be significantly higher than the ones associated with a single facility.

C-10. Visibility

A number of visibility screening runs were performed using the VISCREEN modeling system (VISCREEN, 2013) to evaluate potential effects of OCS activities on visibility from the Tuxedni Wilderness, Alaska Maritime National Wildlife Refuge. VISCREEN calculates the potential impact of a plume of specified emissions for specific transport and dispersion conditions. For a certain distance between a source and an observer and a given set of meteorological conditions, the model calculates plume perceptibility and color contrast for a range of different viewing angles. These parameters are calculated for both a sky and a terrain background. The model does not assess impacts on regional haze; it only evaluates the visibility effects from a single plume. The model runs assumed a 100 km visible range, with a value of 0.04 ppm for background ozone. Table C-4 summarizes the five model runs. For the exploration activity, the screening criteria for plume perceptibility and color contrast were exceeded by a large margin for a 12-km distance between the source and the observer. When the distance is increased to 30 km, the screening thresholds were still exceeded, but by much smaller margins. For a 50-km distance, none of the screening criteria were exceeded.

For a production facility, the screening criteria were exceeded for the 12-km distance between the source and the observer, while none of the criteria are exceeded for a 30-km distance. The modeling was performed using the most conservative meteorological conditions, which are light winds and a stable atmosphere (Class F). For more typical meteorological conditions, the screening criteria were not exceeded. The model results indicate that under certain meteorological conditions, emission sources within about 50 km from the Tuxedni Wilderness, Alaska Maritime National Wildlife Refuge may result in a visible plume for an observer there, but that more rigorous analyses would be needed to more precisely evaluate any effects.

Table C-4. Summary of VISCREEN Modeling Results.

Scenario and Meteorology	Distance, km	Plume Perceptibility			Color Contrast		
		Critical Value	Sky	Terrain	Critical Value	Sky	Terrain
Exploration, 1 m/sec, Stability Class F	12	2.0	15.8	20.3	0.05	-0.091	0.199
Exploration, 2 m/sec, Stability Class F	30	2.0	4.8	4.1	0.05	-0.035	0.052
Exploration, 3 m/sec, Stability Class F	50	2.0	1.4	1.2	0.05	-0.009	0.016
Production 1 m/sec, Stability Class F	12	2.0	7.7	11.3	0.05	-0.047	0.104
Production, 2 m/sec, Stability Class F	30	2.0	1.8	2.0	0.05	-0.010	0.026

Notes: EPA. 2000. Offshore and Coastal Dispersion Model, Version 5 (OCD5), 2000. Available at http://www3.epa.gov/scram001/dispersion_prefrec.htm.
EPA. 2013. SCREEN3 Gaussian Plume Model, 2013. Available at http://www3.epa.gov/scram001/dispersion_screening.htm.
EPA. 2013. VISCREEN Plume Visual Impact Prediction Model, 2013. Available at http://www3.epa.gov/scram001/dispersion_screening.htm.

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Applicable Laws, Regulatory Responsibilities, and Executive Orders

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Appendix D. Applicable Laws, Regulatory Responsibilities, and Executive Orders

TABLE OF CONTENTS

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LIST OF ACRONYMS

ACHP	Advisory Council on Historic Preservation
BA	Biological Assessment
BO	Biological Opinion
BOEM	Bureau of Ocean Energy Management
BSEE	Bureau of Safety and Environmental Enforcement
CAAA	Clean Air Act Amended
CEC	Commission on Environmental Cooperation
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CWA	Clean Water Act
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EPAct	Energy Policy Act
EPCA	Energy Policy and Conservation Act
ESA	Endangered Species Act
FOGRMA	Federal Oil and Gas Royalty Management Act
FWCA	Fish and Wildlife Coordination Act
G&G	Geological and Geophysical
IHA	Incidental Harassment Authorizations
ITA	Incidental Take Authorization
ITS	Incidental Take Statement
LOA	Letters of Authorization
MARPOL	International Convention of the Prevention of Pollution from Ships
MBTA	Migratory Bird Treaty Act
MMPA	Marine Mammal Protection Act
MOU	Memorandum of Understanding
MPA	Marine Protected Areas
MPRSA	Marine Protection, Research, and Sanctuaries Act
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NMSA	National Marine Sanctuaries Act
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NWP	Nationwide Permit
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Lands Act
OPA 90	Oil Pollution Act of 1990
PSD	Prevention of Significant Deterioration
PTSA	Port and Tanker Safety Act
RCRA	Resource Conservation and Recovery Act
RHA	Rivers and Harbors Act
Secretary	Secretary of the Interior
TEIA	Transboundary Environmental Impact Assessment
U.S.	United States
U.S.C.	United States Code
USACE	U.S. Army Corps of Engineers

USCG..U.S. Coast Guard
USEPA..U.S. Environmental Protection Agency
USFWS.......................................U.S. Fish and Wildlife Service
Vtss ....Vessel Traffic Service/Separation Schemes

APPENDIX D. APPLICABLE LAWS, REGULATORY RESPONSIBILITIES, AND EXECUTIVE ORDERS

This appendix provides a brief summary of only those portions of Federal public laws enacted by Congress and other applicable Federal regulatory responsibilities and executive orders (EO) as they relate directly or indirectly to Bureau of Ocean Energy Management (BOEM) management of mineral leasing, exploration and development, and production activities on leases located in the submerged lands of the Outer Continental Shelf (OCS).

This appendix also references certain key responsibilities and jurisdictions of other Federal agencies and departments involved in the regulation of oil and gas operations on the OCS.

This appendix is not intended to be a comprehensive list or explanation. References, explanations, or summaries are given only to summarize the law and are not meant as legal interpretations. The entire text of the laws should be consulted for updates and additional requirements and information.

D-1. FEDERAL LAWS AND REGULATORY RESPONSIBILITIES

D-1.1. OUTER CONTINENTAL SHELF LANDS ACT

The Outer Continental Shelf Lands Act (OCSLA) of 1953 (43 United States Code (U.S.C.) 1331 *et seq*.), as amended, established Federal jurisdiction over submerged lands on the OCS seaward of state boundaries (which were defined in the Submerged Lands Act of 1953) and directs the implementation of an OCS oil and gas exploration and development program. The basic goals of the Act are to:

1. Establish policies and procedures for managing the oil and natural gas resources of the OCS that are intended to result in expedited exploration and development of the OCS in order to achieve national economic and energy policy goals, assure national security, reduce dependence on foreign sources, and maintain a favorable balance of payments in world trade;
2. Preserve, protect, and develop oil and natural gas resources of the OCS in a manner that is consistent with the need (a) to make such resources available to meet the Nation's energy needs as rapidly as possible; (b) to balance orderly resource development with protection of the human, marine, and coastal environments; (c) to ensure the public a fair and equitable return on the resources of the OCS; and (d) to preserve and maintain free enterprise competition;
3. Encourage development of new and improved technology for energy resource production, which will eliminate or minimize risk of damage to the human, marine, and coastal environments; and
4. Ensure that affected States and Local Governments have timely access to information regarding OCS activities and opportunities to review, comment, and participate in policy and planning decisions.

The Secretary of the Interior (Secretary) is responsible under OCSLA for the administration of mineral exploration and development of the OCS. Within the U.S. Department of the Interior (USDOI), BOEM, and the Bureau of Safety and Environmental Enforcement (BSEE) are charged with managing and regulating the development of OCS oil and gas resources in accordance with the provisions of OCSLA. Relevant BOEM and BSEE regulatory provisions include the following:

- 30 CFR 250 — Oil and Gas and Sulphur Operations in the Outer Continental Shelf
  - Contains the regulations of BSEE to regulate oil, gas, and sulphur exploration, development and production operations on the OCS.
  - Establishes procedures under which operators must submit requests, applications, notices, and supplemental information to BSEE for approval.

- 30 CFR 254 — Oil-Spill Response Requirements (discussed further below at Section D.1.14 Oil Pollution Act) as regulated by BSEE.
- 30 CFR 550 — Oil and Gas and Sulphur Operations in the Outer Continental Shelf
    - Contains the regulations of BOEM to regulate oil, gas, and sulphur exploration, development and production operations on the OCS.
    - Establishes procedures under which operators must submit proposed plans, requests, applications, notices, and supplemental information to BOEM. Establishes BOEM's review process and further defines the criteria for BOEM approval of proposed activities.
- 30 CFR 551 — Geological and Geophysical (G&G) Explorations
    - As regulated by BOEM, the requirements for G&G activities in the OCS related to oil, gas, and sulphur on unleased lands or on lands under lease to a third party.
    - Ensures that operators carry out G&G activities in a safe and environmentally sound manner so as to prevent harm or damage to, or waste of, any natural resources (including any mineral deposit in areas leased or not leased), any life (including fish and other aquatic life), property, or the marine, coastal, or human environment.
    - Informs operators and third parties of their legal and contractual obligations, and of the U.S. Government's rights to access G&G data and information collected under permit, as well as proprietary terms of such data.
- 30 CFR 556 — Leasing
    - As regulated by BOEM, establishes the procedures under which the Secretary of the Interior (Secretary) will exercise the authority to administer a leasing program for oil, gas, and sulphur.

OSCLA also extends the authority of the Secretary of the Army, through the U.S. Army Corps of Engineers (USACE), to the OCS to prevent obstruction to navigation in United States (U.S.) navigable waters. OSCLA grants authority to the U.S. Coast Guard (USCG) to promulgate and enforce regulations covering lighting and warning devices, safety equipment, and other safety-related matters pertaining to life and property on fixed OCS platforms and drilling vessels.

D-1.2. NATIONAL ENVIRONMENTAL POLICY ACT

The National Environmental Policy Act (NEPA), signed into law on January 1, 1970 established national environmental policies and requires an EIS to be prepared for major Federal actions that may have a significant impact on the environment. The EIS shall fully discuss significant environmental impacts and inform decision makers and the public of reasonable alternatives, and it must address any adverse environmental effects that cannot be avoided or mitigated, alternatives to the proposed action, the relationship between short-term uses and long-term productivity of the environment, and any irreversible and irretrievable commitments of resources involved in the proposed action.

In 1979, the Council on Environmental Quality (CEQ) established uniform guidelines for implementing the procedural provisions of NEPA. These regulations (40 CFR 1500-1508) provide for the use of the NEPA process to identify and assess reasonable alternatives to a proposed action that avoid or mitigate adverse effects of a given action upon the quality of the human environment. The USDOI also maintains regulations concerning the implementation of NEPA; these are in 43 CFR 46 (73 *FR* 200, October 15, 2008).

D-1.3. ENDANGERED SPECIES ACT

The Endangered Species Act (ESA), enacted in 1973 (16 U.S.C. 1531), provides a program for the conservation of threatened and endangered plants and animals and the ecosystems on which they depend. The ESA was designed to protect and recover critically imperiled species as a “consequence of economic growth and development untempered by adequate concern and conservation” and is administered by the most marine species, while USFWS has responsibility over freshwater fishes and terrestrial species. The ESA prohibits the unauthorized “take” of listed species, with “take” defined as harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, collecting, or attempting to do these things to that species.

Section 7(a)(1) of the ESA directs agencies to utilize their authorities to carry out programs for the conservation of threatened and endangered species. Federal agencies must consult with NMFS and USFWS, under Section 7(a)(2), on activities that may affect a listed species. These interagency, or Section 7, consultations are designed to assist Federal agencies in fulfilling their duty to ensure Federal actions do not jeopardize the continued existence of a species or destroy or adversely modify critical habitat. There are two types of Section 7 consultation: informal and formal.

Informal consultation occurs where a Federal agency determines that its action may affect, but is not likely to adversely affect listed species. Informal consultation is concluded when NMFS or USFWS concurs with the action agency’s determination. During this process, NMFS and USFWS may also identify additional measures to minimize adverse impacts to listed species and/or their designated critical habitat.

Formal consultation is triggered when a Federal agency determines that its action is likely to adversely affect listed species or designated critical habitat. To initiate formal consultation, a Federal agency would submit a consultation package, usually referred to as a Biological Assessment (BA), to USFWS and/or NMFS for proposed actions that may affect listed species or critical habitat. After NMFS and USFWS review the BA, they provide a determination regarding the nature of any effects on each listed species likely to be adversely affected (i.e., subject to take or adverse effect on critical habitat). Formal consultation is concluded when the USFWS and/or NMFS issue a Biological Opinion (BO) containing the necessary and sufficient terms and conditions under which the action can proceed. Where appropriate, NMFS and USFWS may also issue an Incidental Take Statement (ITS) authorizing Federal agencies to take limited numbers of listed species.

BOEM will consult with USFWS and NMFS to ensure the Federal activities proposed in the Cook Inlet Planning Area do not jeopardize the continued existence of threatened or endangered species and/or result in adverse modification or destruction of their critical habitat.

D-1.4. MARINE MAMMAL PROTECTION ACT

The Marine Mammal Protection Act (MMPA) as amended (16 U.S.C. § 1361 *et seq*.) was enacted on October 21, 1972 based on the following findings: marine mammals are resources of great international significance; certain species or stocks are, or may be, in danger of extinction or depletion as a result of man’s activities; such species or stocks should not be permitted to diminish beyond the point at which they cease to be a significant functioning element in the ecosystem of which they are a part, and; the primary objective of their management should be to maintain the health and stability of the marine ecosystem. To serve this broader goal, the MMPA (16 U.S.C. 1371, 50 CFR subpart 1) established a moratorium on the take of marine mammals. The term “take,” as defined in the MMPA, means to harass, hunt, capture, or kill any marine mammal or to attempt such activity. The MMPA defines harassment as any act of pursuit, torment, or annoyance that has the potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment) or disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering (Level B harassment).

There are certain exceptions to the general take prohibition whereby USFWS and NMFS may authorize take. One of these is the issuance of Incidental Take Authorizations (ITAs). Such authorization can be obtained through a Letter of Authorization (LOA) or an Incidental Take Authorization (IHA).

Letters of Authorization (LOAs) are predicated on the promulgation of regulations outlining:

- Permissible methods and the specified geographical region of taking;
- The means of effecting the least practicable adverse impact on the species or stock and its habitat and on the availability of the species or stock for “subsistence” uses; and,
- Requirements for monitoring and reporting, including requirements for the independent peer-review of proposed monitoring plans where the proposed activity may affect the availability of a species or stock for taking for subsistence uses.

Meanwhile, IHAs may be granted for specific requests to incidentally take small numbers of marine mammals by harassment within a specified timeframe. In order to authorize incidental take of marine mammals under through either an LOA or IHA, USFWS or NMFS (whichever has jurisdiction over the marine mammals at issue) must first find that the taking would be of small numbers, have no more than a negligible impact on those marine mammal species or stocks, and not have an unmitigable adverse impact on the availability of the species or stock for subsistence uses.

To ensure that activities on the OCS adhere to MMPA regulations, BOEM actively seeks information concerning impacts of OCS activities on local species of marine mammals and coordinates with USFWS and NMFS.

D-1.5. MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

The Magnuson-Stevens Fishery Conservation and Management Act of 1976 (16 U.S.C. § 1801 *et seq*.) established and delineated an area from the states’ seaward boundary to approximately 200 nautical miles from shore as a fisheries conservation zone for the U.S. and its possessions. The Act created eight regional Fishery Management Councils and mandated a continuing planning program for marine fisheries management by the Fishery Management Councils. The Act, as amended, requires that a Fishery Management Plan (50 CFR 600), based on the best available scientific and economic data, be prepared for each commercial species (or related group of species) of fish in need of conservation and management within each respective region.

The Magnuson-Stevens Fishery Conservation and Management Act was reauthorized by Congress through passage of the Sustainable Fisheries Act of 1996. This reauthorization implements a number of reforms and changes. One change required NMFS to designate and conserve Essential Fish Habitat (EFH) for those species managed under an existing Fishery Management Plan. By designating EFHs, Congress hoped to minimize, to the extent practicable, any adverse effects on habitat caused by fishing or non-fishing activities and to identify other actions to encourage the conservation and enhancement of such habitat. The phrase “essential fish habitat,” as defined in the Sustainable Fisheries Act of 1996, encompasses “those waters and substrate necessary to fishes for spawning, breeding, feeding, or growth to maturity.” As a result of this change, Federal agencies must consult with NMFS on those activities that may have direct (for example, physical disruption) or indirect (for example, loss of prey species) effects on EFH.

Of the Fishery Management Plans for Alaskan fisheries, the plans for the Gulf of Alaska groundfish and statewide salmon and scallop management plans designate EFH within the Alaska OCS Cook Inlet Planning Area. The Fishery Management Plans are amended and updated as new information from studies and public input is received and assessed. BOEM will consult with NMFS concerning potential effects to EFH and has prepared an EFH assessment for use in that process.

D-1.6. MIGRATORY BIRD TREATY ACT

The Migratory Bird Treaty Act (MBTA) of 1918 (16 U.S.C. 703–712) is the primary legislation in the U.S. established to conserve migratory birds. It implements the U.S.'s commitment to four bilateral treaties, or conventions, for the protection of a shared migratory bird resource. The MBTA prohibits the taking, killing, or possessing of migratory birds unless permitted by regulation.

D-1.7. CLEAN AIR ACT

The Clean Air Act (CAA) of 1970 (42 U.S.C. § 7401 *et seq*.), is the comprehensive federal law that regulates air emissions from stationary and mobile sources. The CAA authorizes the U.S. Environmental Protection Agency (USEPA) to set National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. At present, USEPA has set NAAQS for six principal (or "criteria") pollutants: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), particle pollution ($PM_{2.5}$ and PM_{10}), and sulfur dioxide (SO_2). Facilities (e.g. oil and gas drilling rigs and production platforms) that emit a certain amount of criteria pollutants must obtain and abide by the terms of CAA permits. Pursuant to Section 112 of the CAA, the USEPA has also developed technology-based emissions standards for hazardous air pollutants.

Section 309 requires the USEPA to review and comment on the environmental impact of certain proposed actions of other Federal agencies in accordance with NEPA. The comments must be in writing and made available to the public at the conclusion of a review. If the USEPA determines that the proposed action is unsatisfactory from the standpoint of public health or welfare or environmental quality, they must publish that determination and the matter must be referred to the CEQ.

D-1.8. CLEAN WATER ACT

The Clean Water Act (CWA) (33 U.S.C. §1251 *et seq*. (1972)) established the basic structure for regulating discharges of pollutants into the waters of the U.S. and regulating quality standards for surface waters. Under the CWA, it is unlawful for any person to discharge any pollutant from a point source into navigable waters without a National Pollutant Discharge Elimination System (NPDES) permit. USEPA may not issue a permit for a discharge into ocean waters unless the discharge complies with the guidelines established under Section 403(c) of the CWA. These guidelines are intended to prevent degradation of the marine environment and require an assessment of the effect of the proposed discharges on sensitive biological communities and aesthetic, recreational, and economic values. Before a permit may be granted, the assessment must demonstrate that the proposed discharge(s) will not cause unreasonable degradation to the marine environment based on the ten factors specified at 40 CFR § 125.122.

Section 311 of the CWA (33 U.S.C. § 1321), as amended, prohibits the discharge of oil or hazardous substances into the navigable waters of the U.S. that may affect natural resources, except under limited circumstances, and establishes civil penalty liability and enforcement procedures to be administered by the USCG.

In conjunction with the issuance of a NPDES permit, the USEPA is responsible for publishing an Ocean Discharge Criteria Evaluation that evaluates the impacts of waste discharges proposed for oil and gas projects. The purpose of the Ocean Discharge Criteria Evaluation is to demonstrate whether or not a particular discharge will cause unreasonable degradation to the marine environment.

Section 404 of the CWA (33 U.S.C. § 1344) authorizes issuance of permits, under certain criteria, for discharge of dredged or fill material into navigable waters at specified disposal sites. The Secretary of the Army, acting through the USACE, has the authority to administer Section 404.

The USACEs Nationwide Permit (NWP) Program, also called a general permit was developed to streamline the evaluation and approval process for certain types of activities that have only minimal impacts to the aquatic environment. These permits may also grant authorization under various provisions of the Rivers and Harbors Act (see D.1.15, below). Any applicant that intends to use a NWP should ensure that their proposed activity meets the terms, conditions, and any regional conditions of the NWP, and any additional Section 401 water quality requirements. Most G&G survey activities qualify for one of two NWPs. NWP 5 covers the placement of Scientific Measurement Devices such as staff gauges, tide gauges, water recording devices, water quality testing and improvement devices, and similar structures, applicable to certain G&G activities such as the temporary installation of meteorological buoys or other data collection devices. NWP 6 addresses survey activities such as core sampling, seismic exploratory operations, plugging of seismic shot holes and other exploratory-type bore holes, exploratory trenching, soil surveys, sampling, and historic resources surveys. Most G&G survey activities would require a NWP 6. Drilling and discharge of excavated material from test wells for oil and gas exploration are not authorized by NWP 6 and would require a Section 404/Section 10 Permit, also called a standard permit.

D-1.9. ENERGY POLICY AND CONSERVATION ACT

The Energy Policy and Conservation Act (EPCA) (P.L.94-163, 42 U.S.C. § 6201), enacted December 22, 1975, responded to the 1973 oil crisis by creating a comprehensive approach to Federal energy policy. The primary goals of the EPCA are to increase energy production and supply, reduce energy demand, provide energy efficiency, and give the executive branch additional powers to respond to disruptions in energy supply. Bidders submitting bids on OCS leases are subject to the provisions of 18 U.S.C. 1860. BOEM regulations implementing certain provisions of the EPCA are at 30 CFR Part 556.

D-1.10. INTERNATIONAL CONVENTION OF THE PREVENTION OF POLLUTION FROM SHIPS AND MARINE PLASTICS POLLUTION RESEARCH AND CONTROL ACT

The 1978 International Convention of the Prevention of Pollution from Ships (MARPOL) contains five annexes on ocean dumping. Annex V is of particular importance to the maritime community (for example, shippers, oil- platform personnel, fishers, and recreational boaters) because it prohibits the disposal of plastics at sea and regulates the disposal of other types of garbage at sea. The USCG is the enforcement agency for MARPOL Annex V within the U.S. Exclusive Economic Zone (EEZ) (within 200 miles of the U.S. shoreline).

The Marine Plastic Pollution Research and Control Act of 1988 (33 U.S.C. § 1901 *et seq*.) is the Federal law implementing MARPOL Annex V in all U.S. waters. Under the Marine Plastic Pollution Research and Control Act, it is illegal to throw plastic trash off any vessel within the U.S. EEZ, and to throw any other garbage overboard while navigating in inland waters or within 3 miles offshore. Fixed and floating platforms, drilling rigs, manned productions platforms, and support vessels operating under a Federal oil and gas lease are required to develop waste management plans and to post placards reflecting discharge limitations and restrictions.

D-1.11. MARINE PROTECTION, RESEARCH, AND SANCTUARIES ACT

The Marine Protection, Research, and Sanctuaries Act (MPRSA) (33 U.S.C. § 1401 *et seq*.), enacted in 1972 and also referred to as the Ocean Dumping Act, generally prohibits (1) transportation of material from the U.S. for the purpose of ocean dumping; (2) transportation of material from anywhere for the purpose of ocean dumping by U.S. agencies or U.S.-flagged vessels; and (3) dumping of material transported from outside the U.S. into the U.S. territorial sea. A permit is required to deviate from these prohibitions. Permits for dumping dredged material into ocean waters are issued by the USACE.

Under MPRSA, the standard for permit issuance is whether the dumping will "unreasonably degrade or endanger" human health, welfare, or the marine environment. USEPA is charged with developing ocean dumping criteria to be used in evaluating permit applications. The MPRSA contains provisions that address marine sanctuaries which are administered by the National Oceanic and Atmospheric Administration (NOAA). A reauthorization of Title III in 1992 resulted in the renaming of this section to the National Marine Sanctuaries Act (NMSA).

D-1.12. NATIONAL FISHING ENHANCEMENT ACT

The National Fishing Enhancement Act of 1984 (33 U.S.C. § 2101 *et seq*.), also known as the Artificial Reef Act, established broad artificial reef development standards and a national policy to encourage the development of artificial reefs that will enhance fishery resources and commercial and recreational fishing. The National Plan identifies oil and gas structures as acceptable material of opportunity for artificial reef development. BOEM adopted a rigs-to-reefs policy in 1985 in response to this Act and to broaden interest in the use of petroleum platforms as artificial reefs.

D-1.13. NATIONAL HISTORIC PRESERVATION ACT

The National Historic Preservation Act (NHPA) of 1966, as amended, established a program for the preservation of historic properties. Section 106 of the NHPA (36 CFR 800), “Protection of Historic Properties,” as amended through 2004, requires that Federal agencies having direct or indirect jurisdiction over a proposed Federal, Federally assisted, or Federally licensed undertaking, prior to approval of the expenditure of funds or the issuance of a license, to take into account the effect of the undertaking on any district, site, building, structure, or object included in or eligible for inclusion in the National Register of Historic Places. The Advisory Council on Historic Preservation (ACHP), which administers Section 106, has issued regulations (36 CFR 800) defining how Federal agencies are to meet the statutory responsibilities. The head of a Federal agency shall afford the ACHP a reasonable opportunity to review and comment on the undertaking.

An undertaking has an effect on a historic property when it has the potential to alter the characteristics of the property that led to its inclusion in the National Register of Historic Places. The effects can include physical disturbance, noise, or visual effects. If an adverse effect on historic properties is found, BOEM would notify the ACHP, consult with the State Historic Preservation Office, and encourage the applicant to avoid, minimize, or mitigate the adverse effects. Ground-disturbing activities associated with construction, as well as visual effects of OCS energy infrastructure are subject to Section 106 review.

Historic properties (i.e., archaeological resources) on the OCS include historic shipwrecks, sunken aircraft, lighthouses, and prehistoric archaeological sites that have become inundated as a result of the 120-m (394-ft) rise in global sea level since the height of the last Ice Age (ca. 19,000 years ago).

Before approving any OCS exploration or development activities within an archaeologically sensitive area, BOEM requires the lessee to conduct a marine remote-sensing survey and to prepare an archaeological report (30 CFR 550.194).

Archaeological surveys are required both onshore and offshore in areas where there is the potential for archaeological resources to exist, so that potential impacts to archaeological resources from physical disturbance could be mitigated. If the marine remote-sensing survey indicates any evidence of a potential historic property, the lessee must either:

- Move the site of the proposed lease operations a sufficient distance to avoid the potential historic property, or
- Conduct further investigations to determine the nature and significance of the potential historic property. If further investigation determines that there is a significant historic

property within the area of proposed OCS operations, NHPA consultation procedures will be followed.

D-1.14. OIL POLLUTION ACT

The Oil Pollution Act of 1990 (OPA 90), as amended (33 U.S.C. § 2701 *et seq*.), establishes a single uniform Federal system of liability and compensation for damages caused by oil spills in U.S. navigable waters. The OPA 90 requires removal of spilled oil and establishes a national system of planning for and responding to oil-spill incidents. The OPA 90 includes provisions to:

- Improve oil-spill prevention, preparedness, and response capability;
- Establish limitations on liability for damages resulting from oil pollution;
- Provide funding for natural resource damage assessment;
- Implement a fund for the payment of compensation for such damages; and
- Establish an oil pollution research and development program.

The USCG is responsible for enforcing vessel compliance with OPA 90. The USCG regulations on the oil-spill liability of vessels and operators are under 33 CFR §§ 132, 135, and 136.

Section 1016 of OPA 90 (33 U.S.C. § 2716), as amended by the Coast Guard Authorization Act of 1996, supersedes the offshore oil-spill financial-responsibility provision of Title III of the OCSLA Amendments of 1978, previously administered by the USCG. Under OPA 90 and EO 12777 - Implementation of Section 311 of the Federal Water Pollution Control Act of October 18, 1972, as Amended, and the Oil Pollution Act of 1990 (October 18, 1991), the Secretary is given authority over covered offshore facilities and associated pipelines (except deepwater ports) for all Federal and State waters. The Secretary delegated this authority to BOEM or BSEE. The resulting tasks for BOEM include the following: reviewing exploration and development plans, reviewing spill financial liability limits, and certifying spill financial responsibility.

BOEM regulations are at 30 CFR 553 that implement Title I of the OPA 90 establish the requirements for demonstrating oil-spill financial responsibility for covered offshore facilities requiring responsible parties to demonstrate they can pay for cleanup and damages caused by facility oil spills. These regulations govern financial responsibility requirements for: oil spills, covered offshore facilities and related requirements, certain crude oil wells, production platforms, and pipelines located in the OCS and certain State waters.

BSEE oil spill response regulations at 30 CFR 254 require that an owner or operator of an oil handling, storage, or transportation facility located seaward of the coast line must submit a spill-response plan to BSEE for approval. The spill-response plan must demonstrate the ability to respond quickly and effectively to any oil emission (other than natural seepage), intentional or unintentional, including but not limited to, spilling, leaking, pumping, pouring, emitting, emptying, or dumping that is discharged from the facility.

D-1.15. RIVERS AND HARBORS ACT

The Rivers and Harbors Act (RHA) (33 U.S.C. 401, 403, 407), enacted in 1899, was the first Federal water pollution act in the U.S. It focuses on protecting navigation, protecting waters from pollution, and acted as a precursor to the CWA of 1972.

Various sections of this Act establish permit requirements to prevent unauthorized obstruction or alteration of any navigable water of the U.S. The USACE, through the Secretary of the Army, has permitting authority for any structure work conducted in or affecting U.S. navigable waters and for construction of artificial islands, fixed structures, and other installations on the OCS. This authority arises from a provision in the OCSLA (43 U.S.C. § 1333(e)) that extends the Secretary of the Army's authority to prevent obstruction to navigation in U.S. navigable waters from structures located on the OCS that are used for exploring, developing, producing, or transporting natural resources.

Section 10 (33 U.S.C. 403) prohibits the unauthorized obstruction or alteration of any navigable water of the U.S., that is, construction of various structures that hinder navigable capacity of any waters, without the approval of Congress. While the initial purpose of the Act was to prevent obstructions to navigation, a 1959 Supreme Court decision interpreted obstruction to navigation to include water pollution. In addition, Section 10 authorizes the USACE, through the Secretary of the Army, to issue permits for all offshore construction in U.S. navigable waters, including pipelines, exploratory drilling vessels, fixed and mobile platforms, piers, wharves, bulkheads, or other works. Permits also must be issued for onshore facilities that involve dredging, filling, and excavating in U.S. navigable waters. Section 10 is applicable for structures, installations, and other devices on the OCS seabed. Section 10 is not applicable to most actions undertaken for exploration on the OCS, the exception being drilling and discharge of excavated material from test wells, as they fall under NWP-6. A NWP-5 for "Scientific Measurement Devices" and NWP-6 for "Survey Activities" are both appropriate for Section 10 actions.

D-1.16. RESOURCE CONSERVATION AND RECOVERY ACT

The Resource Conservation and Recovery Act (RCRA) of 1976 (42 U.S.C. § 6901 *et seq*.), and as amended through 1996, provides a framework for the safe disposal and management of hazardous and solid wastes. Most oil-field wastes have been exempted from coverage under the RCRA hazardous-waste regulations. Any hazardous wastes that are not exempt must be disposed of at a hazardous-waste facility.

D-1.17. PORTS AND WATERWAYS SAFETY ACT

The Ports and Waterways Safety Act (PWSA) (33 U.S.C. § 1221 *et seq*.) enacted in 1972, authorizes the USCG to establish vessel traffic service/separation schemes (VTSS) for ports, harbors, and other waters subject to congested vessel traffic. The VTSS apply to commercial ships, other than fishing vessels, weighing 300 gross tons (270 gross metric tons) or more. The USCG is authorized to designate safety fairways, fairway anchorages, and traffic separation schemes to provide unobstructed approaches through oil fields for vessels using ports. The USCG regulations provide listings of these designated areas along with special conditions related to oil and gas production. In general, no fixed structures such as platforms are allowed in fairways. Temporary underwater obstacles such as anchors and attendant cables or chains attached to floating or semisubmersible drilling rigs may be placed in a fairway under certain conditions. Fixed structures may be placed in anchorages, but the number of structures is limited. The USCG regulations on port access routes are found under 33 CFR § 164.

The PWSA generally applies in any port or place under the jurisdiction of the U.S., or in any area covered by an international agreement. Title 33 CFR 2.05-30 defines waters subject to the jurisdiction of the U.S. as navigable waters, other waters on lands owned by the U.S., and waters within U.S. territories and possession of the U.S. The PWSA was amended by the Port and Tanker Safety Act (PTSA) of 1978 (Public Law 95-474). Under the PTSA, Congress found that increased supervision of vessel and port operations was necessary to reduce the possibility of vessel or cargo loss, or damage to life, property or the marine environment and ensure that the handling of dangerous articles and substances on the structures in, on, or immediately adjacent to the navigable waters of the U.S. is conducted in accordance with established standards and requirements.

The PTSA provided broader regulatory authority over regulated and non-regulated areas such as improvements in the supervision and control of all types of vessels operating in U.S. navigable waters, and in the safety of foreign or domestic tank vessels that transport or transfer oil or hazardous cargoes in ports or places subject to U.S. jurisdiction. The PTSA also reflects certain tank vessel standards and requirements accepted internationally, specifically those developed by the International Conference on Tanker Safety and Pollution Prevention.

D-1.18. FEDERAL OIL AND GAS ROYALTY MANAGEMENT ACT

The Federal Oil and Gas Royalty Management Act (FOGRMA) of 1982 (30 U.S.C. § 701 *et seq*.), was enacted to ensure that all oil and gas originating on public land and on the OCS are properly accounted for under the direction of the Secretary. This Act defines the responsibilities and obligations of lessees, operators, and other persons involved in the transportation of oil and gas from Federal, Indian, and OCS lands. The Secretary has the responsibility to maintain a royalty management system and enforce the prompt collection and disbursement of oil and gas revenues owed to the U.S., Indian lessors, and the states.

The Secretary oversees a comprehensive inspection and collection system with fiscal and production accounting and auditing systems to accurately determine oil and gas royalties, interest, fines, penalties, fees, deposits, and other payments owed and to collect and account for the payments in a timely manner.

The FOGRMA requires a lessee, operator, or other person directly involved in the developing, producing, transporting, purchasing, or selling of oil and gas to establish and maintain records, make reports, and provide information as required by the Secretary.

Regulations at 30 CFR 1201 through 1243 were published by BOEM to implement the provisions of the FOGRMA. Regulations at 30 CFR 1218 through 1256 address royalties, net profit shares, Fisherman's Contingency Fund, and rental payments on Federal OCS leases.

D-1.19. BALD EAGLE PROTECTION ACT

The Bald Eagle Protection Act (16 U.S.C. § 668-668d) prohibits the taking or possession of and commerce in bald and golden eagles, with limited exceptions. This Act imposes criminal and civil penalties on anyone (including associations, partnerships and corporations) in the U.S. or within its jurisdiction who, unless excepted, takes, possesses, sells, purchases, barters, offers to sell or purchase or barter, transports, exports or imports at any time or in any manner a bald or golden eagle, alive or dead; or any part, nest or egg or these eagles; or violates any permit or regulations issued under the Act. The Secretary may permit the taking of golden eagle nests which interfere with resource development or recovery operations. Bald eagles may not be taken for any purpose unless the Secretary issues a permit prior to taking. Authorized USDOI employees who witness a violation of this Act may arrest the violator without a warrant and take the person to an officer or court.

D-1.20. COASTAL ZONE MANAGEMENT ACT

Pursuant to the Coastal Zone Management Act (CZMA) and the Coastal Zone Reauthorization Amendments of 1990, all Federal activities, including OCS oil and gas lease sales and post-lease activities, must be consistent to the maximum extent practicable with the enforceable policies of each affected state's coastal zone management program. The federally-approved Alaska Coastal Management Program expired on June 30, 2011, and the Federal consistency provision no longer applies in Alaska. Consequently, Federal agencies are not required to provide the State of Alaska with CZMA Consistency Determinations pursuant to 16 U.S.C. § 1456(c)(1) and (2), and 15 CFR 930, Subpart C (76 *FR* 39857, July 7, 2011).

D-2. EXECUTIVE ORDERS

- D-2.1. Executive Order 13212 – Actions to Expedite Energy-Related Projects
- D-2.2. Executive Order 13580 – Interagency Working Group on Coordination of Domestic Energy Development and Permitting in Alaska

- D-2.3. Executive Order 12898 – Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations
- D-2.4. Executive Order 13175 – Consultation and Coordination with Indian Tribal Governments
- D-2.5. Executive Order 13007 – Indian Sacred Sites
- D-2.6. Executive Order 13158 – Marine Protected Areas
- D-2.7. Executive Order 13186 – Responsibilities of Federal Agencies To Protect Migratory Birds
- D-2.6. Executive Order 13547 – Stewardship of the Ocean, Our Coasts, and the Great Lakes
- D-2.7. Executive Order 13112 – Invasive Species
- D-2.8. Executive Order 11990 – Protection of Wetlands
- D-2.10. Executive Order 11988 – Floodplain Management

D-2.1. EXECUTIVE ORDER 13212 – ACTIONS TO EXPEDITE ENERGY-RELATED PROJECTS

The EO 13212, issued by President George W. Bush on May 18, 2001, states that "… in order to take additional steps to expedite the increased supply and availability of energy to our Nation …," (66 *FR* 99, May 22, 2001) it is necessary to improve the Federal Government's internal management of actions associated with energy-related projects. In general, the EO directs executive departments and agencies to take appropriate actions to expedite projects that will increase the production, transmission, or conservation of energy. Departments and agencies must expedite their review of permits or take other actions as necessary to accelerate the completion of such projects while maintaining safety, public health, and environmental protections. Agencies must take such actions to the extent permitted by law, the regulations, and where appropriate.

D-2.2. EXECUTIVE ORDER 13580 - INTERAGENCY WORKING GROUP ON COORDINATION OF DOMESTIC ENERGY DEVELOPMENT AND PERMITTING IN ALASKA

Signed by President Obama on July 12, 2011, the Executive Order establishes an Interagency Working Group on Coordination of Domestic Energy Development and Permitting in Alaska. The EO policy recognizes the importance for the safe, responsible, and efficient development of oil and natural gas resources in Alaska both onshore and the OCS, while protecting the human health and the environment, as well as indigenous populations. The EO formalizes the interagency coordination at a high-level. The Interagency Working Group is led by the Department of the Interior with membership at the deputy-level of the Department of Defense; Department of Commerce; Department of Agriculture; Department of Energy; Department of Homeland Security; the Environmental Protection Agency; and Office of the Federal Coordinator for Alaska Natural Gas Transportation Projects. (Note: the Office of the Federal Coordinator for Alaska Natural Gas Transportation Projects was abolished.); other deputy-level equivalent representation include the Council on Environmental Quality, Office of Science and Technology Policy, Office of Management and Budget, and National Security Staff. The functions of the Interagency Working Group are: (a) facilitate orderly and efficient decision making regarding the issuance of permits and conduct of environmental reviews for onshore and offshore energy development projects in Alaska; (b) ensure that the schedules and progress of agency regulatory and permitting activities are coordinated appropriately, that they operate efficiently and effectively, and that agencies assist one another, as appropriate; (c) facilitate the sharing of application and project information among agencies, including information regarding anticipated timelines and milestones; (d) ensure the sharing and integrity of scientific and environmental information and cultural and traditional knowledge among agencies to support the permit evaluation process of onshore and offshore energy development projects in Alaska; (e) engage in long-term planning and ensure coordination with the appropriate Federal entities related to such issues as oil spill prevention, preparedness and response, and the development of necessary infrastructure to adequately support energy development in Alaska; (f) coordinate Federal engagement with States, localities, and tribal governments, as it relates to energy development and permitting issues in Alaska, including: (i) designate a primary point of contact to facilitate coordination with the State of Alaska; (ii) designate a primary point of contact to facilitate coordination with local communities, governments, tribes, co-management organizations, and similar Alaska Native organizations; (g) collaborate on stakeholder outreach; and (h) promote interagency dialogue with respect to communications with industry regarding Alaska offshore and onshore energy development and permitting issues.

D-2.3. EXECUTIVE ORDER 12898 – FEDERAL ACTIONS TO ADDRESS ENVIRONMENTAL JUSTICE IN MINORITY POPULATIONS AND LOW-INCOME POPULATIONS

Signed on February 11, 1994, by President William J. Clinton, EO 12898 required that each Federal agency, to the greatest extent practicable and permitted by law, make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. The EO required that within one year each Federal agency develop an environmental justice strategy that identified and addressed disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations. The CEQ has oversight of the Federal Government's compliance with EO 12898. The CEQ guidance for implementation of EO 12898 in the context of NEPA (CEQ, 1997) identifies a minority population as an affected area where more than 50 percent of the population belongs to a minority group or where the percentage presence of minority groups is meaningfully greater than in the general population (59 *FR* 32, February 16, 1994).

Agencies are required to incorporate into their NEPA documents analysis of the environmental effects of their proposed action on minorities and low-income populations and communities. The environmental justice issues encompass a broad range of impacts covered by NEPA, and concerns may arise from impacts on the natural or physical environment or from interrelated social, cultural, and economic effects.

Environmental justice concerns are considered anywhere where OCS projects and associated NEPA documentation take place; however, issues concerning Alaska OCS-related impacts primarily have focused on the subsistence hunting, fishing, and gathering activities that occur in coastal areas.

D-2.4. EXECUTIVE ORDER 13175 – CONSULTATION AND COORDINATION WITH INDIAN TRIBAL GOVERNMENTS

Signed on November 6, 2000, by President William J. Clinton, EO 13175 established regular and meaningful consultation and collaboration with tribal officials in the development of Federal policies that have tribal implications, to strengthen the U.S. Government-to-government relationships with Indian Tribes, and to reduce the imposition of unfunded mandates upon Indian Tribes. EO 13175 reaffirmed the Federal Government's commitment to a Government-to-government relationship with Indian Tribes, and directed Federal agencies to establish procedures to consult and collaborate with Tribal Governments when new agency regulations would have tribal implications. This EO is a directive to all Federal agencies, but it only has persuasive authority for independent regulatory agencies (i.e., the Federal Communications Commission, Securities and Exchange Commission, etc.), and is not meant to create a right, substantial or procedural, that is enforceable by law.

D-2.5. EXECUTIVE ORDER 13007 – INDIAN SACRED SITES

Signed on May 24, 1996, by President William J. Clinton, EO 13007 directs Federal land-managing agencies to accommodate access to, and ceremonial use of, Indian sacred sites by Indian religious practitioners and to avoid adversely affecting the physical integrity of such sacred sites. It is BOEMs policy to consider the potential effects of all aspects of plans, projects, programs, and activities on Indian sacred sites, and to consult with Tribal Governments before taking actions that may affect Indian sacred sites located on Federal lands (61 *FR* 104, May 29, 1996).

D-2.6. EXECUTIVE ORDER 13158 – MARINE PROTECTED AREAS

Signed on May 26, 2000, by President William J. Clinton, EO 13158 strengthened and expanded the nation's system of marine protected areas (MPAs) (65 *FR* 105, May 26, 2000). Specifically, the EO was to, consistent with domestic and international law: (a) strengthen the management, protection, and conservation of existing marine protected areas and establish new or expanded MPAs; (b) develop a scientifically based, comprehensive national system of MPAs representing diverse U.S. marine ecosystems, and the nation's natural and cultural resources; and (c) avoid causing harm to MPAs through Federally conducted, approved, or funded activities. More than 1,700 such Federal and state/territory sites exist today.

This EO directs Federal agencies to work closely with State, Local, and non-governmental partners to create a comprehensive system of MPAs "representing diverse U.S. marine ecosystems, and the nation's natural and cultural resources." Ultimately, the MPA system will include new sites, as well as enhancements to the conservation of existing sites. The MPA Center, established under EO 13158, was created to support and link MPA programs, providing the best available science and tools, as well as a means to work together to address common management challenges. In cooperation with the USDOI and working closely with other organizations, the MPA Center coordinates the effort to implement the EO and:

- Develops the framework for a national system of MPAs;
- Coordinates the development of information, tools, and strategies;
- Provides guidance that will encourage efforts to enhance and expand the protection of existing MPAs and to establish or recommend new ones;
- Coordinates the MPA website;
- Partners with Federal and non-Federal organizations to conduct research, analysis, and exploration;
- Helps maintain the National MPA List; and
- Supports the MPA Advisory Committee.

D-2.7. EXECUTIVE ORDER 13186, RESPONSIBILITIES OF FEDERAL AGENCIES TO PROTECT MIGRATORY BIRDS

EO 13186, Responsibilities of Federal Agencies To Protect Migratory Birds, directed that each Federal agency taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations is directed to develop and implement, within two years, a MOU with USFWS that shall promote the conservation of migratory bird populations (66 *FR* 11, January 10, 2001). On June 4, 2009, USDOI entered into an MOU with USFWS to comply with EO 13186 (USDOI, 2009). The overall purpose of the MOU is to strengthen collaboration between BOEM and BSEE and USFWS. Included in the MOU is the direction to expand coverage in environmental reviews mandated by NEPA of the effects of agency actions on migratory birds, with emphasis on species of concern in furtherance of conservation of migratory bird populations.

D-2.8. EXECUTIVE ORDER 13547 – STEWARDSHIP OF THE OCEAN, OUR COASTS, AND THE GREAT LAKES

Signed on July 19, 2010, by President Obama, EO 13547 established a National Ocean Policy and the National Ocean Council (75 *FR* 140, July 22, 2010). The EO establishes a national policy to ensure the protection, maintenance, and restoration of the health of ocean, coastal, and Great Lakes ecosystems and resources, enhance the sustainability of ocean and coastal economies, preserve our maritime heritage, support sustainable uses and access, provide for adaptive management to enhance our understanding of and capacity to respond to climate change and ocean acidification, and coordinate with U.S. national security and foreign policy interests. Where BOEM actions affect the ocean, the EO requires BOEM to take such action as necessary to implement this policy, the stewardship principles, and national priority objectives adopted by the EO, and guidance from the National Ocean Council.

The National Ocean Policy, created by EO 13547, established the National Ocean Council, which consists of 27 Federal agencies, offices, and departments (including BOEM) that work together to share information and streamline decision-making (National Ocean Council, 2013). EO 13547 adopted the Final Recommendations of the Interagency Ocean Policy Task Force which provided:

- A framework for the Nation's first ever National Policy for the Stewardship of the Ocean, Coasts and Great Lakes;
- A governance structure to provide sustained high-level and coordinated attention to ocean, coastal, and Great Lakes issues;
- An implementation strategy that identifies nine priority objectives; and
- A framework for effective Marine Planning employing a comprehensive and integrated Ecosystem-Based Management approach (BOEM, 2015).

D-2.9. EXECUTIVE ORDER 13112 – INVASIVE SPECIES

Signed on February 3, 1999, by President William J. Clinton, EO 13112 was intended to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause (64 *FR* 25, February 8, 1999). EO 13112 defines an "invasive species" as a species that is not native (or alien) to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health. This EO requires all Federal agencies to:

- Identify any actions affecting the status of invasive species
- Prevent invasive-species introduction
- Detect and respond to and control populations of invasive species in a cost-effective and environmentally sound manner
- Monitor invasive-species populations accurately and reliably
- Provide for restoration of native species and habitat conditions in invaded ecosystems
- Conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species
- Promote public education on invasive species and the means to address them
- Refrain from authorizing, funding, or carrying out actions that are likely to cause or promote invasive species introduction or spread, unless the Federal agency has determined that the benefits of such actions clearly outweigh the potential harm caused by invasive species and that all feasible and prudent measures to minimize risk of harm will be taken

D-2.10. EXECUTIVE ORDER 11990 – PROTECTION OF WETLANDS

Signed on May 24, 1977, by President Jimmy Carter, EO 11990 directs Federal agencies to avoid construction or management practices that would adversely affect wetlands unless that agency finds that (1) there is no practicable alternative, and (2) the proposed action includes all practicable measures to minimize harm to the wetlands. It directs all Federal agencies to minimize the destruction, loss, or degradation of wetlands; and preserve and enhance the natural beneficial values of wetlands in the conduct of the agency's responsibilities (EO 11990, 1977).

D-2.11. EXECUTIVE ORDER 11988 – FLOODPLAIN MANAGEMENT

Signed on May 24, 1977, by President Jimmy Carter, EO 11988 directs Federal agencies to avoid construction or management practices that would adversely affect floodplains unless that agency finds (1) there is no practical alternative and (2) the proposed action has been designed or modified to minimize harm to or within the floodplain. The EO directs all Federal agencies to reduce the risk of flood loss; minimize the impact of floods on human safety, health, and welfare; and to restore and preserve the natural and beneficial values served by floodplains in carrying out the agency's responsibilities (EO 11988, 1977).

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APPENDIX E

Estimate of Employment, Population, and Fiscal Impacts

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Estimate of Employment, Population and Fiscal Impacts

OCS Sale 244: Upper Cook Inlet

July 2015

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TABLE OF CONTENTS

List of Tables

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EXECUTIVE SUMMARY

This report is input to the socioeconomic impact analysis for the OCS Sale 244 EIS, Upper Cook Inlet, scheduled for 2016. The exploration and development scenario underlying the analysis was provided by BOEM in their "Lease Sale 244, Cook Inlet EIS Exploration and Development Scenario" ("BOEM scenario").

This report contains the estimated direct employment estimates for the Kenai Peninsula Borough (KPB) applied to each segment (exploration, development, and production). The direct employment estimates generate direct earnings estimates. Indirect and induced employment and earnings multipliers are applied to the direct employment and earnings to yield total employment and earnings. The employment estimates generate population estimates. Finally, the fiscal impact to the KPB, State of Alaska, and federal government are estimated.

During the exploration phase employment is from seismic surveys (including geohazard and geotechnical work) and exploration and delineation drilling. During the development phase there is employment from platform installation, development drilling, and pipeline construction. During the production phase there is platform and shore-based employment to produce oil and gas.

This report utilizes the best available public information. Some of this is through literature searches and interviews with knowledgeable parties. Some of the data is based on current and planned activities associated with offshore development in Furie Alaska's Kitchen Lights Unit, and BlueCrest Energy's Cosmopolitan Unit, the first offshore developments in Cook Inlet since 2000, as analogs to what actually OCS development would look like. The former is currently under development for planned production to commence this year. The latter is in feasibility planning.

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1. SEISMIC, GEOHAZARD, AND GEOTECHNICAL SURVEYS

Per the BOEM scenario these scenarios would occur in late summer / early fall, and could continue until freeze-up before December 1. There would be one seismic survey in years 1 and 2, one geohazard survey in year 1 and two in years 2 and 3, and one technical survey in year 1 and two in years 2 and 3.

It is assumed a 3-D seismic survey contains 120 people on 7-8 boats that operate 24 hours per day. This includes two complete crews, with one-third of the crew rotating every 30 days. Geohazard and geotechnical surveys consist of 1-2 boats with 20 people that operate 24 hours per day. This also includes two complete crews, with one-third of the crew rotating every 30 days.[1]

Table 1 shows the estimates for the surveying employment.

TABLE 1: DIRECT EMPLOYMENT ESTIMATES – SEISMIC/GEOHAZARDS/GEOTECHNICAL

Year	Seismic					Geohazards					GeoTechnical					Total
	Number of Surveys	Crew Size	Rotation	Seasonality	Subtotal	Number of Surveys	Crew Size	Rotation	Seasonality	Subtotal	Number of Surveys	Crew Size	Rotation	Seasonality	Subtotal	
1	1	115	1.33	0.25	38	1	20	1.33	0.25	7	1	20	1.33	0.25	7	**52**
2	1	115	1.33	0.25	38	2	20	1.33	0.25	13	2	20	1.33	0.25	13	**65**
3	0	115	1.33	0.25	0	2	20	1.33	0.25	13	2	20	1.33	0.25	13	**27**

2. EXPLORATION / DELINEATION DRILLING

Per the BOEM scenario exploratory / delineation drilling would occur in years 2 (3 wells), 3 (3 wells), 4 (2 wells), and 5 (2 wells), for a total of 10 wells. Each well would take 30-60 days to drill, and a rig could drill three wells in a season.

Even though the recent offshore exploratory drilling from jack-up rigs utilized outside crews, it is assumed that due to the longevity of the program local crews would be used. An estimated 100 jobs is required for rig operation during exploration.[2]

Table 2 displays the estimated direct employment for exploratory / delineation drilling.

TABLE 2: DIRECT EMPLOYMENT ESTIMATES – EXPLORATION/DELINEATION DRILLING

Year	Number of Wells	Crew Size	Seasonality	Total
1	0	100	0.167	0
2	3	100	0.167	50
3	3	100	0.167	50
4	2	100	0.167	33
5	2	100	0.167	33

[1] Conversations with SAExploration and Apache Corporation, June 23, 2015.
[2] AIDEA, Project Development and Asset Management Project Summary Matrix Active Projects, February 2015.

3. DEVELOPMENT: PLATFORM INSTALLATION

The Kitchen Lights platform currently under construction in Cook Inlet is a monopod platform consisting of modular components built elsewhere and shipped up. Because the installation is so specialized, and because there is only one platform involved, specialized crews from the Gulf of Mexico are being employed. Crews reside on support vessels, and most vendor supplies are from outside. There is little interaction with the community.

Per the BOEM scenario there would be three platforms. It is assumed the platform installation would proceed no differently than under the Kitchen Lights experience. Therefore, the direct employment impact to the KPB.

4. DEVELOPMENT: DRILLING

Per the BOEM scenario production and service wells would be drilled in years 7 (3 wells), 8 (9 wells), 9 (12 wells), 10 (15 wells), 11 (15 wells), 12 (6 wells), and 13 (6 wells), for a total of 66 wells. A maximum of 6 wells could be drilled from any platform in a year.

It is estimated there would be 28 jobs associated with each well.3

Table 3 shows the estimated direct employment from development drilling.

TABLE 3: DIRECT EMPLOYMENT ESTIMATES – DEVELOPMENT DRILLING				
Year	Number of Wells	Crew Size	Seasonality	Total
7	3	28	0.167	14
8	9	28	0.167	42
9	12	28	0.167	56
10	15	28	0.167	70
11	15	28	0.167	70
12	6	28	0.167	28
13	6	28	0.167	28

5. DEVELOPMENT: PIPELINES CONSTRUCTION

Per the BOEM scenario there would be 50 miles each of onshore oil and gas pipelines, 85 miles of offshore oil pipelines, and 115 miles of offshore gas pipelines. Pipeline diameter would be 12 inches.

[3] Petroleum News Alaska, "Furie inching closer to kitchen lights startup," 11/16/14.

The onshore pipe would be installed in year 6. There would be 60 miles of offshore oil pipe installed in year 6 and 25 miles in year 9. There would be 60 miles of offshore gas pipeline installed in year 6, 30 miles in year 7, and 25 miles in year 9.

Per the BOEM scenario the offshore pipe would be installed with subsea trenching jets similar to proposed Trans-Foreland pipeline, which will run between east and west Cook Inlet.

The Trans-Foreland pipeline is an 8-inch diameter pipe, which will run 29 miles. It is anticipated a crew of 130 will install the pipe in 6 months (0.16 miles per day), followed by 12 permanent operations jobs.[4]

Accordingly, at 29 miles per crew per year (working in the ice-free season), there would be 4 offshore crews working in year 6, 1 crew in year 7, and 2 crews in year 9.

For the onshore pipe it is estimated an onshore crew of 20 could install the pipe in one year.[5] This would be 0.3 miles per day, similar to the Kenai Kachemak Pipeline construction experience in 2002.[6] There would be an estimated 6 jobs associated with ongoing operation.

Table 4 displays the estimated direct employment for pipeline construction.

TABLE 4: DIRECT EMPLOYMENT ESTIMATES – PIPELINE CONSTRUCTION

	ONSHORE				OFFSHORE				TOTAL
Year	Crews	Size of Crew	Seasonality	Subtotal	Crews	Size of Crew	Seasonality	Subtotal	
6	1	20	1.0	20	4	130	0.5	260	280
7	0	20	1.0	0	1	130	0.5	65	65
8	0	20	1.0	0	0	130	0.5	0	0
9	0	20	1.0	0	2	130	0.5	130	130

4 Petroleum News Alaska, “Cook Inlet Energy works west side,” 11/17/13.
5 The INGAA Foundation, Inc., “Building Interstate Natural Gas Transmission Pipelines: A Primer,” January 2013, p.25.
6 Petroleum News Alaska, “Gas delivery to Enstar driving Kenai Kachemak Pipeline schedule,” 1/20/02.

6. ON-SHORE FACILITIES

Per the BOEM scenario, there will be sufficient onshore capacity for shore bases and oil and gas processing. Accordingly no such facilities will be required.

7. PRODUCTION

Per the BOEM scenario oil production (and small amounts of associated gas) would occur from two platforms beginning in year 7 and 10, respectively, and continue through year 33. Gas production would occur from one platform in years 8-33. It is estimated there would 15 permanent jobs for each platform for operation and maintenance, and administration and support.[7]

As discussed above, there would also be 12 offshore long-term positions and 6 onshore positions associated with the pipelines.

Table 5 depicts the estimated direct employment for the production phase.

[7] Memo from Ted Leonard, Executive Director, Alaska Industrial & Development Export Authority to Board Members regarding Resolution No. G15—01 Authorizing Cost Reimbursement between AIDEA, Furie Operating Alaska, LLC and Cornucopia Oil & Gas Co., LLC, January 14, 2015.

TABLE 5: DIRECT EMPLOYMENT ESTIMATES – PRODUCTION						
Year	Oil Platform 1	Oil Platform 2	Gas Platform	Onshore Pipe	Offshore Pipe	TOTAL
7	15	0	0	6	12	33
8	15	0	15	6	12	48
9	15	0	15	6	12	48
10	15	15	15	6	12	63
11	15	15	15	6	12	63
12	15	15	15	6	12	63
13	15	15	15	6	12	63
14	15	15	15	6	12	63
15	15	15	15	6	12	63
16	15	15	15	6	12	63
17	15	15	15	6	12	63
18	15	15	15	6	12	63
19	15	15	15	6	12	63
20	15	15	15	6	12	63
21	15	15	15	6	12	63
22	15	15	15	6	12	63
23	15	15	15	6	12	63
24	15	15	15	6	12	63
25	15	15	15	6	12	63
26	15	15	15	6	12	63
27	15	15	15	6	12	63
28	15	15	15	6	12	63
29	15	15	15	6	12	63
30	15	15	15	6	12	63
31	15	15	15	6	12	63
32	15	15	15	6	12	63
33	15	15	15	6	12	63

8. DIRECT EMPLOYMENT SUMMARY

Table 6 is a summary of the all the direct employment. It is categorized by the distinct occupational multiplier groupings described below. These include extraction (production), drilling (exploration / delineation and development drilling), and support activities (seismic, geohazard, and geotechnical surveys, and pipeline construction and operation and maintenance).

The figures are adjusted for non-resident employment. It is estimated that 18% of non-Alaska residents accounted for the KPB oil and gas industry workforce in 2011.[8] These are workers who commute from out of state in to and out of the Borough.

[8] McDowell Group, "Cook Inlet Oil and Gas Industry Labor Force Assessment," May 2013, p.2.

TABLE 6: DIRECT EMPLOYMENT ESTIMATES – SUMMARY OF DIRECT EMPLOYMENT ADJUSTED FOR NON-RESIDENT LABOR				
Year	Extraction 1/	Drilling 2/	Support 3/	TOTAL
1	0	0	42	42
2	0	41	53	94
3	0	41	22	63
4	0	27	0	27
5	0	27	0	27
6	0	0	230	230
7	12	11	68	92
8	25	34	15	74
9	25	46	121	192
10	37	57	15	109
11	37	57	15	109
12	37	23	15	75
13	37	23	15	75
14	37	0	15	52
15	37	0	15	52
16	37	0	15	52
17	37	0	15	52
18	37	0	15	52
19	37	0	15	52
20	37	0	15	52
21	37	0	15	52
22	37	0	15	52
23	37	0	15	52
24	37	0	15	52
25	37	0	15	52
26	37	0	15	52
27	37	0	15	52
28	37	0	15	52
29	37	0	15	52
30	37	0	15	52
31	37	0	15	52
32	37	0	15	52
33	37	0	15	52

1 Includes production
2 Includes exploration/delineation and development drilling
3 Includes seismic, geohazard, and geotechnical surveys and pipeline construction and o&m
4 Adjusted for 18% non-resident workforce

The remainder is new jobs in the Borough. As discussed in the population section below, it is not anticipated there would be commuting between Anchorage and the Mat-Su Borough to the KPB to any material extent.

The economic impact from the 18% non-Alaska residents would be widely distributed geographically. The following tables focus on impacts to the KPB.

9. EARNINGS

An estimate of the increase in direct earnings can be derived by using local wage data. The average annual wage for oil and gas industry employment in the Kenai Peninsula Borough in 2011 was $98,445.[9] In 2015 dollars this would be $109,000. This value was applied to all direct employment in the multiplier analysis.

Table 7 depicts the estimated additional direct earnings in 2015 dollars.

10.INDIRECT AND INDUCED EMPLOYMENT (MULTIPLIER ANALYSIS)

The direct impacts, depicted above, are the first round of inputs purchased by the final-demand industry; the value of inputs purchased in the on-site spending by the final-demand industry. Once the additional direct employment and earnings are estimated, the total economic impact on the region is estimated. This includes the cumulative effects on total industry employment and earnings that result from the additional direct employment. This is executed through multipliers, which depict the ratios of total changes in regional economies to an initial change.

The indirect impact relates to the subsequent rounds of inputs purchased by supporting supply industries with intermediate goods to the on-site direct spending.

The induced impact is the value of goods and services purchased by all workers whose earnings are affected by the final-demand change; the retail and wholesale jobs created when the direct and indirect employment spend their money on other products in the economy.

For this analysis the U.S. Department of Commerce, Bureau of Economic Analysis (BEA), Regional Input-Output Modeling System (RIMS II) multipliers were utilized. Regional input-output multipliers are based on a set of detailed set of industry accounts that measures the goods and services produced by each industry and the use of these goods and services by final users.[10]

[9] McDowell Group, *op. cit*., p.20.
[10] User Guide can be found at https://www.bea.gov/regional/pdf/rims/rimsii_user_guide.pdf

TABLE 7: DIRECT EARNINGS ESTIMATES				
Year	Extraction	Drilling	Support	TOTAL
1	$0	$0	$5	$5
2	$0	$4	$6	$10
3	$0	$4	$2	$7
4	$0	$3	$0	$3
5	$0	$3	$0	$3
6	$0	$0	$25	$25
7	$1	$1	$7	$10
8	$3	$4	$2	$8
9	$3	$5	$13	$21
10	$4	$6	$2	$12
11	$4	$6	$2	$12
12	$4	$3	$2	$8
13	$4	$3	$2	$8
14	$4	$0	$2	$6
15	$4	$0	$2	$6
16	$4	$0	$2	$6
17	$4	$0	$2	$6
18	$4	$0	$2	$6
19	$4	$0	$2	$6
20	$4	$0	$2	$6
21	$4	$0	$2	$6
22	$4	$0	$2	$6
23	$4	$0	$2	$6
24	$4	$0	$2	$6
25	$4	$0	$2	$6
26	$4	$0	$2	$6
27	$4	$0	$2	$6
28	$4	$0	$2	$6
29	$4	$0	$2	$6
30	$4	$0	$2	$6
31	$4	$0	$2	$6
32	$4	$0	$2	$6
33	$4	$0	$2	$6

The multipliers are derived from two sources. A national input-output table, an accounting framework that shows the distribution of the inputs purchased and outputs sold, and regional data, which are used to adjust the national input-output table to reflect the region's industrial structure and trading patterns. In this case the region is the Kenai Peninsula Borough, a region for which BEA has estimated multipliers.

The two specific multipliers utilized in this analysis are the direct-effect multipliers for employment and earnings. The former is the ratio of the total change in jobs per change in job in the final-demand industry. The latter is the ratio of the total change in household earnings per dollar change in household earnings in the final-demand industry.

Type I multipliers measure the direct and indirect employment and earnings. Type II multipliers measure the direct, indirect, and induced employment and earnings, yielding the total impact.

The direct-effect multipliers are applied to the estimated direct increases in employment and earnings to conduct the analysis. BEA provides these two multipliers for three job classes associated with oil and gas. These are oil and gas extraction, drilling oil and gas wells, and support activity for oil and gas operations. Specific tasks were allocated into the three categories as described in Table 6 above.

The multipliers are depicted in Table 8.

The employment multipliers represent the total change in number of jobs in all industries for each additional job in the industry corresponding to the entry. The earnings multipliers represent the total dollar change in earnings of households employed by all industries for each additional dollar of earnings paid directly to households employed by the industry corresponding to the entry.

It can be noted that the multipliers between the job categories do not vary much.

Using these multipliers, total employment in the region (direct, indirect, and induced) is expected to increase by the product of the multiplier and the direct employment. Total earnings in the region are expected to increase by the product of the multiplier and the direct earnings.

TABLE 8: DIRECT EFFECT RIMS II MULTIPLIERS		
Employment (Jobs)		**Earnings (Dollars)**
TYPE I (INDIRECT)		
Oil & gas extraction	1.3877	1.3101
Drilling oil & gas wells	1.2186	1.1653
Support activity for oil & gas operations	1.3045	1.1777
TYPE II (INDIRECT & INDUCED)		
Oil & gas extraction	1.9151	1.5705
Drilling oil & gas wells	1.6788	1.3969
Support activity for oil & gas operations	1.8583	1.4118
Source: BEA		

Table 9A, using the Type I multipliers, depicts the increased direct and indirect employment. Table 9B, using the Type II multipliers, depicts the increased direct, indirect, and induced (and hence total) employment. Table 9C breaks out employment between direct, indirect, induced, and total.

Table 10A, using the Type I multipliers, depicts the increased direct and indirect earnings. Table 10B, using the Type II multipliers, depicts the increased direct, indirect, and induced (and hence total) earnings. Table 10C breaks out earnings between direct, indirect, induced, and total.

11.POPULATION IMPACT

Previous tables show the estimates for the increases in jobs from Cook Inlet OCS activity. As described, they were adjusted for non-Alaska residents; i.e., workers who commute in and out of the Borough from out of the state. The remainder will reside in the Borough, given that the jobs are there. Population impacts will depend on the extent to which current residents do not assume the new jobs.

Current residents make take these jobs to the extent there is unemployment in the Borough, and to the extent they either have the necessary skills for those jobs, or can be trained for them.

Current unemployment in the Kenai Peninsula Borough is 7.4%[11] Total employment in 2014 was 20,782.[12] This implies 1,538 are unemployed. Total Borough population in 2010 per the census was 55,400.

There are several entities in the area that offer some level of training for oil and gas occupations. Nevertheless, experience is generally a more important qualification than entry-level training.

Also note that while there are 1,113 oil and gas jobs within the Borough, there are 1,773 residents that work oil and gas occupations on the North Slope, where wages are generally higher than Cook Inlet.[13] To

[11] Alaska Department of Labor, “Alaska Economic Trends,” July 2015, p.14.
[12] Alaska Department of Labor, “Census of Employment and Wages,” 2014.
[13] Alaska Department of Labor, “Alaska Economic Trends,” June 2013, p.7.

the extent a KPB resident who works on the North Slope gets a new job in the KPB, it is still a new KPB job. This would create a North Slope vacancy that presumably would not be filled by another KPB resident.

There are over 7,000 Anchorage and Mat-Su residents employed on the North Slope. It follows that the propensity for then to move to the KPB would be low. It is not anticipated that there would be any appreciable commuting between Anchorage/Mat-Su and the KPB. (To the extent they might relocate to take new jobs, the state population would remain unchanged.)

There is some question as to the extent workers might relocate during the exploration and development phases. However, this phase lasts 13 years in the BOEM scenario, in principle the non-resident employment adjustments implicitly address relocation, and the jobs numbers themselves are relatively low, especially with the assumed platform installation being performed by non-residents. (The only possible exception might be the short period of extensive pipeline construction in years 6 and 9.)

There is little data to precisely ascertain the exact dynamics that will determine the population outcome. To the extent there is full employment in the Borough all new employment would result in new population. This, of course, is not the case. Accordingly, to account qualitatively and directionally for new jobs that would be held by current residents, it has been assumed that 10 percent of the jobs will be taken by unemployed residents. This would be a peak of 43 jobs during development and 10 jobs during the production phase.

The average number of people per household for the KPB was 2.5 from 2009-2013.[14] The increased population from the Sale 244 development is estimated as the product of the increased total employment as adjusted for current residents taking new jobs, and the average number of people per household. Table 11 depicts the estimated increase in population.

[14] United States Census Bureau, “American Community Survey,” 2013.

TABLE 9A: DIRECT & INDIRECT EMPLOYMENT ESTIMATES				
Year	Extraction	Drilling	Support	TOTAL
1	0	0	55	55
2	0	50	69	119
3	0	50	28	78
4	0	33	0	33
5	0	33	0	33
6	0	0	300	300
7	17	14	89	120
8	34	42	20	96
9	34	56	158	248
10	51	70	20	141
11	51	70	20	141
12	51	28	20	99
13	51	28	20	99
14	51	0	20	71
15	51	0	20	71
16	51	0	20	71
17	51	0	20	71
18	51	0	20	71
19	51	0	20	71
20	51	0	20	71
21	51	0	20	71
22	51	0	20	71
23	51	0	20	71
24	51	0	20	71
25	51	0	20	71
26	51	0	20	71
27	51	0	20	71
28	51	0	20	71
29	51	0	20	71
30	51	0	20	71
31	51	0	20	71
32	51	0	20	71
33	51	0	20	71

TABLE 9B: TOTAL EMPLOYMENT ESTIMATES – INCLUDED DIRECT, INDIRECT & INDUCED				
Year	Extraction	Drilling	Support	TOTAL
1	0	0	79	79
2	0	69	99	168
3	0	69	41	109
4	0	46	0	46
5	0	46	0	46
6	0	0	427	427
7	24	19	126	169
8	47	58	28	133
9	47	77	225	349
10	71	96	28	195
11	71	96	28	195
12	71	39	28	137
13	71	39	28	137
14	71	0	28	99
15	71	0	28	99
16	71	0	28	99
17	71	0	28	99
18	71	0	28	99
19	71	0	28	99
20	71	0	28	99
21	71	0	28	99
22	71	0	28	99
23	71	0	28	99
24	71	0	28	99
25	71	0	28	99
26	71	0	28	99
27	71	0	28	99
28	71	0	28	99
29	71	0	28	99
30	71	0	28	99
31	71	0	28	99
32	71	0	28	99
33	71	0	28	99

TABLE 9C: DIRECT, INDIRECT, & INDUCED EMPLOYMENT ESTIMATES

Year	Direct	Indirect	Induced	TOTAL
1	42	13	23	79
2	94	25	48	168
3	63	16	31	109
4	27	6	13	46
5	27	6	13	46
6	230	70	127	427
7	92	28	49	169
8	74	22	37	133
9	192	57	101	349
10	109	31	54	195
11	109	31	54	195
12	75	24	38	137
13	75	24	38	137
14	52	19	28	99
15	52	19	28	99
16	52	19	28	99
17	52	19	28	99
18	52	19	28	99
19	52	19	28	99
20	52	19	28	99
21	52	19	28	99
22	52	19	28	99
23	52	19	28	99
24	52	19	28	99
25	52	19	28	99
26	52	19	28	99
27	52	19	28	99
28	52	19	28	99
29	52	19	28	99
30	52	19	28	99
31	52	19	28	99
32	52	19	28	99
33	52	19	28	99

TABLE 10A: DIRECT & INDIRECT EARNINGS ESTIMATES (millions of 2015 dollars)				
Year	Extraction	Drilling	Support	TOTAL
1	$0	$0	$5	$5
2	$0	$5	$7	$12
3	$0	$5	$3	$8
4	$0	$3	$0	$3
5	$0	$3	$0	$3
6	$0	$0	$30	$30
7	$2	$1	$9	$12
8	$4	$4	$2	$10
9	$4	$6	$16	$25
10	$5	$7	$2	$14
11	$5	$7	$2	$14
12	$5	$3	$2	$10
13	$5	$3	$2	$10
14	$5	$0	$2	$7
15	$5	$0	$2	$7
16	$5	$0	$2	$7
17	$5	$0	$2	$7
18	$5	$0	$2	$7
19	$5	$0	$2	$7
20	$5	$0	$2	$7
21	$5	$0	$2	$7
22	$5	$0	$2	$7
23	$5	$0	$2	$7
24	$5	$0	$2	$7
25	$5	$0	$2	$7
26	$5	$0	$2	$7
27	$5	$0	$2	$7
28	$5	$0	$2	$7
29	$5	$0	$2	$7
30	$5	$0	$2	$7
31	$5	$0	$2	$7
32	$5	$0	$2	$7
33	$5	$0	$2	$7

TABLE 10B: TOTAL EARNINGS ESTIMATES – INCLUDES DIRECT, INDIRECT & INDUCED				
(millions of 2015 dollars)				
Year	Extraction	Drilling	Support	TOTAL
1	$0	$0	$7	$7
2	$0	$6	$8	$14
3	$0	$6	$3	$10
4	$0	$4	$0	$4
5	$0	$4	$0	$4
6	$0	$0	$35	$35
7	$2	$2	$10	$14
8	$4	$5	$2	$12
9	$4	$7	$19	$30
10	$6	$9	$2	$17
11	$6	$9	$2	$17
12	$6	$3	$2	$12
13	$6	$3	$2	$12
14	$6	$0	$2	$9
15	$6	$0	$2	$9
16	$6	$0	$2	$9
17	$6	$0	$2	$9
18	$6	$0	$2	$9
19	$6	$0	$2	$9
20	$6	$0	$2	$9
21	$6	$0	$2	$9
22	$6	$0	$2	$9
23	$6	$0	$2	$9
24	$6	$0	$2	$9
25	$6	$0	$2	$9
26	$6	$0	$2	$9
27	$6	$0	$2	$9
28	$6	$0	$2	$9
29	$6	$0	$2	$9
30	$6	$0	$2	$9
31	$6	$0	$2	$9
32	$6	$0	$2	$9
33	$6	$0	$2	$9

TABLE 10C: DIRECT, INDIRECT & INDUCED EARNINGS ESTIMATES (millions of 2015 dollars)				
Year	Direct	Indirect	Induced	TOTAL
1	$5	$1	$1	$7
2	$10	$2	$2	$14
3	$7	$1	$2	$10
4	$3	$0	$1	$4
5	$3	$0	$1	$4
6	$25	$4	$6	$35
7	$10	$2	$2	$14
8	$8	$2	$2	$12
9	$21	$4	$5	$30
10	$12	$3	$3	$17
11	$12	$3	$3	$17
12	$8	$2	$2	$12
13	$8	$2	$2	$12
14	$6	$2	$1	$9
15	$6	$2	$1	$9
16	$6	$2	$1	$9
17	$6	$2	$1	$9
18	$6	$2	$1	$9
19	$6	$2	$1	$9
20	$6	$2	$1	$9
21	$6	$2	$1	$9
22	$6	$2	$1	$9
23	$6	$2	$1	$9
24	$6	$2	$1	$9
25	$6	$2	$1	$9
26	$6	$2	$1	$9
27	$6	$2	$1	$9
28	$6	$2	$1	$9
29	$6	$2	$1	$9
30	$6	$2	$1	$9
31	$6	$2	$1	$9
32	$6	$2	$1	$9
33	$6	$2	$1	$9

12.FISCAL IMPACT

12.1. Property Tax: Kenai Peninsula Borough and State of Alaska

Since development would occur in federal waters, the state (and KPB) would receive neither bonus bids, royalties, nor production or state corporate income taxes. The borough would receive property taxes for assets on borough land. As cited above, per the BOEM scenario, there would be no new onshore facilities.

The borough would receive property tax from the 100 miles of onshore pipelines. The Kenai Kachemak Pipeline, also 12-inch diameter, constructed in 2002, cost $45 million, or $75,000 per inch mile.[15] With inflation it is estimated these pipelines would cost $100,000 per inch mile. This lines up closely with many other recent estimates.[16]

One hundred miles of 12-inch diameter pipeline at $100,000 per inch mile would cost $120 million. At the borough's 4.5 mill rate this would amount to $540,000 in property tax starting in year 6, subject to inflation and depreciation.

The difference between the state rate of 20 mills and the Borough rate of 4.5 mills goes to the State of Alaska. This would be $1.86 million in year 6.

Table 12 shows the property tax by year. Over the life of the project the Borough would receive $8 million, and the State $27 million, in 2015 dollars.

12.2. Revenues to Federal Government; Royalties and Corporate Income Tax

12.2.1. Royalties

Table 13 displays the estimated federal royalties from the lease sale. Oil and natural gas volumes were given as part of the BOEM scenarios. Total oil is 214 million barrels, and total gas is 567 billion cubic feet.

The oil price forecast was from the Department of Energy, Energy Information Administration "Annual Energy Outlook" (April 14, 2015). These are in 2015 dollars for Brent crude oil.[17]

[15] Petroleum News Alaska, "Marathon joins Kenai Kachemak Pipeline Project consortium," 9/23/01.
[16] For example, see Oil & Gas Journal, "Billions Needed to Meet Long-Term Natural Gas Infrastructure Supply, Demands," April 2009.
[17] The forecast contains 3% real annual long-term growth and is higher than many other projections.

TABLE 11: TOTAL POPULATION IMPACT	
Year	
1	177
2	377
3	246
4	103
5	103
6	962
7	381
8	299
9	785
10	439
11	439
12	308
13	308
14	222
15	222
16	222
17	222
18	222
19	222
20	222
21	222
22	222
23	222
24	222
25	222
26	222
27	222
28	222
29	222
30	222
31	222
32	222
33	222

TABLE 12: ESTIMATED PROPERTY TAX					
(millions of 2015 dollars)					
Year	**Expenditure**	**Assessed Value**	**Total Prop Tax**	**To Kenai Pen Bor**	**To State of Alaska**
6	$120	$120	$2.40	$0.54	$1.86
7		$116	$2.31	$0.52	$1.79
8		$111	$2.23	$0.50	$1.73
9		$107	$2.14	$0.48	$1.66
10		$103	$2.06	$0.46	$1.59
11		$99	$1.97	$0.44	$1.53
12		$94	$1.89	$0.42	$1.46
13		$90	$1.80	$0.40	$1.39
14		$86	$1.71	$0.39	$1.33
15		$81	$1.63	$0.37	$1.26
16		$77	$1.54	$0.35	$1.20
17		$73	$1.46	$0.33	$1.13
18		$69	$1.37	$0.31	$1.06
19		$64	$1.28	$0.29	$1.00
20		$60	$1.20	$0.27	$0.93
21		$56	$1.11	$0.25	$0.86
22		$51	$1.03	$0.23	$0.80
23		$47	$0.94	$0.21	$0.73
24		$43	$0.86	$0.19	$0.66
25		$38	$0.77	$0.17	$0.60
26		$34	$0.68	$0.15	$0.53
27		$30	$0.60	$0.13	$0.46
28		$26	$0.51	$0.12	$0.40
29		$21	$0.43	$0.10	$0.33
30		$17	$0.34	$0.08	$0.26
31		$13	$0.25	$0.06	$0.20
32		$8	$0.17	$0.04	$0.13
33		$4	$0.08	$0.02	$0.06
Total			**$34.77**	**$7.82**	**$26.94**

The assumed gas price was the current Enstar price of $6.77 per mcf.

The royalty is the gross value at the lease boundary, which is the market price less pipeline tariffs. The estimated pipeline tariffs are $0.56/bbl for oil and $0.27/mcf for gas.[18]

The royalty rate was assumed to be 12.5%, the same as the last Cook Inlet Sale # 191.

Total royalties are $3.6 billion in 2015 dollars.

12.2.2. Federal Income Tax

Federal corporate income taxes are gross revenues minus expenses, subject to the tax rate, which is 35%.

Table 14 shows the estimated gross revenues for oil and gas, a total of $28.8 billion.

Table 15 shows the estimated costs. Due to uncertainties as to precisely how development would occur and the operating environment, coupled with the uniqueness of the operating environment, there is considerable variability surrounds these cost estimates.

The estimated cost of the seismic and other survey programs would be $50 million, based on Apache's proposed 5-year program on the Kenai Peninsula.[19]

Exploration wells are estimated to cost $25 million each based on the Kitchen Lights experience, for a total of $250 million.[20]

Platform costs are estimated at $350 million each based on Kitchen Lights and adjusted for additional slots and water depth, for a total of $1.05 billion.[21]

Development wells are estimated at $10 million each, based on a rig rate of $175,000 per day, for a total of $660 million.[22]

Operating costs (opex) are estimated at $10 per barrel for oil and $1/mcf for gas.[23]

The estimated total costs, including royalties and property tax, before income tax, are $8.4 billion in 2015 dollars.

Table 16 shows the tax calculation.

Seismic and other survey costs are amortized over 7 years.

Exploration drilling costs are considered intangible, and as such are 70% expensed, with the remaining 30% amortized over 5 years.

Platform costs are depreciated over 7 years.

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[18] The cost of the pipelines underlying the tariffs were the $120 million discussed above for the onshore pipe and $530 mm for the offshore based on $221,000 per inch mile (Petroleum News Alaska, "Plans unfolding for building new trans-Cook Inlet pipeline," June 24, 2012.

[19] Petroleum News Alaska, "Apache eyeing long game in Cook Inlet exploration," June 7, 2015.

[20] Petroleum News Alaska, "Furie nearing the finish line at Kitchen Lights unit," July 20, 2014.

[21] Petroleum News Alaska, "$50M loan would improve Kitchen Lights economics: due diligence approved," January 25, 2015.

[22] Petroleum News Alaska, "BlueCrest plotting course at Cosmopolitan unit," June 7, 2015.

[23] Van Meurs Corporation, World Rating of Oil and Gas Terms: Volume 6A, 2013, p. 56.

Development wells are assumed to be 80% intangible. 70% of the intangible portion is expensed with the remaining 30% amortized over 5 years. The 20% that is not intangible is depreciated over 5 years.

Operating costs are expensed.

Total estimated income taxes are $7.2 billion.

Finally, note that bonus bids to the federal government have not been estimated insofar as they involve assessments of geological risk. Thus the federal revenue estimates are understated by the after-tax amount of the bid.[24] However, in terms of materiality, at these prices and costs it would probably take a rather favorable geological assessment approaching a 50% probability of success to justify a $1 billion bid.

TABLE 13: FEDERAL ROYALTY ESTIMATES (millions of 2015 dollars)							
Year	Oil Vol (mmbbl)	Gas Vol (bcf)	Oil Price ($/bbl)	Gas Price ($/mcf)	Oil Royalty ($mm)	Gas Royalty ($mm)	Total Royalty ($mm)
7	1	0	$93	$6.77	$12	$0	$12
8	5	8	$95	$6.77	$59	$7	$66
9	9	30	$98	$6.77	$110	$24	$134
10	14	48	$101	$6.77	$176	$39	$215
11	20	66	$104	$6.77	$259	$54	$313
12	22	65	$107	$6.77	$293	$53	$346
13	25	61	$110	$6.77	$343	$50	$393
14	22	53	$114	$6.77	$311	$43	$354
15	18	44	$117	$6.77	$262	$36	$298
16	15	36	$121	$6.77	$225	$29	$255
17	12	29	$124	$6.77	$186	$24	$209
18	10	24	$128	$6.77	$159	$20	$179
19	8	20	$132	$6.77	$131	$16	$147
20	7	16	$135	$6.77	$118	$13	$131
21	5	13	$139	$6.77	$87	$11	$97
22	4	11	$143	$6.77	$71	$9	$80
23	4	9	$148	$6.77	$74	$7	$81
24	3	7	$152	$6.77	$57	$6	$63
25	2	6	$156	$6.77	$39	$5	$44
26	2	5	$161	$6.77	$40	$4	$44
27	2	4	$165	$6.77	$41	$3	$44
28	1	3	$170	$6.77	$21	$2	$24
29	1	3	$175	$6.77	$22	$2	$24
30	1	2	$180	$6.77	$22	$2	$24
31	1	2	$185	$6.77	$23	$2	$25
32	0	1	$190	$6.77	$0	$1	$1
33	0	1	$195	$6.77	$0	$1	$1
TOTAL	**214**	**567**			**$3,142**	**$461**	**$3,603**

[24] The bids are deductible. This would be 65% (1 – 35%) of the bid amount.

TABLE 14: GROSS OIL & GAS REVENUE ESTIMATES									
(millions of 2015 dollars)									
Year	**Oil Vol (mmbbl)**	**Gas Vol (bcf)**	**Oil Price ($/bbl)**	**Gas Price ($/mcf)**	**Oil Tariff ($/bbl)**	**Gas Tariff ($/mcf)**	**Oil Gross Val ($mm)**	**Gas Gross Val ($mm)**	**Tot Gross Val ($mm)**
1									
2									
3									
4									
5									
6									
7	1	0	$93	$6.77	$0.56	$0.27	$92	$0	$92
8	5	8	$95	$6.77	$0.56	$0.27	$474	$52	$526
9	9	30	$98	$6.77	$0.56	$0.27	$878	$195	$1,073
10	14	48	$101	$6.77	$0.56	$0.27	$1,407	$312	$1,719
11	20	66	$104	$6.77	$0.56	$0.27	$2,071	$429	$2,500
12	22	65	$107	$6.77	$0.56	$0.27	$2,347	$423	$2,769
13	25	61	$110	$6.77	$0.56	$0.27	$2,747	$397	$3,144
14	22	53	$114	$6.77	$0.56	$0.27	$2,491	$345	$2,835
15	18	44	$117	$6.77	$0.56	$0.27	$2,099	$286	$2,385
16	15	36	$121	$6.77	$0.56	$0.27	$1,802	$234	$2,036
17	12	29	$124	$6.77	$0.56	$0.27	$1,485	$189	$1,673
18	10	24	$128	$6.77	$0.56	$0.27	$1,273	$156	$1,429
19	8	20	$132	$6.77	$0.56	$0.27	$1,048	$130	$1,178
20	7	16	$135	$6.77	$0.56	$0.27	$944	$104	$1,048
21	5	13	$139	$6.77	$0.56	$0.27	$694	$85	$778
22	4	11	$143	$6.77	$0.56	$0.27	$571	$72	$643
23	4	9	$148	$6.77	$0.56	$0.27	$590	$59	$648
24	3	7	$152	$6.77	$0.56	$0.27	$455	$46	$500
25	2	6	$156	$6.77	$0.56	$0.27	$312	$39	$351
26	2	5	$161	$6.77	$0.56	$0.27	$321	$33	$353
27	2	4	$165	$6.77	$0.56	$0.27	$330	$26	$356
28	1	3	$170	$6.77	$0.56	$0.27	$169	$20	$189
29	1	3	$175	$6.77	$0.56	$0.27	$174	$20	$194
30	1	2	$180	$6.77	$0.56	$0.27	$179	$13	$192
31	1	2	$185	$6.77	$0.56	$0.27	$184	$13	$197
32	0	1	$190	$6.77	$0.56	$0.27	$0	$7	$7
33	0	1	$195	$6.77	$0.56	$0.27	$0	$7	$7
TOTAL	**214**	**567**					**$25,138**	**$3,686**	**$28,823**

TABLE 15: ESTIMATED COSTS

(millions of 2015 dollars)

Year	Seismic	Explr Wells	Platforms	Dev Wells	Oil Opex	Gas Opex	Royalties	Property Tax	TOTAL
1	$20	$75							$95
2	$20	$75							$95
3	$10	$50							$60
4		$50							$50
5									$0
6				$30				$2	$32
7			$350	$90	$10	$0	$12	$2	$464
8			$350	$120	$50	$8	$66	$2	$596
9				$150	$90	$30	$134	$2	$406
10			$350	$150	$140	$48	$215	$2	$905
11				$60	$200	$66	$313	$2	$640
12				$60	$220	$65	$346	$2	$693
13					$250	$61	$393	$2	$706
14					$220	$53	$354	$2	$629
15					$180	$44	$298	$2	$524
16					$150	$36	$255	$2	$442
17					$120	$29	$209	$1	$360
18					$100	$24	$179	$1	$304
19					$80	$20	$147	$1	$249
20					$70	$16	$131	$1	$218
21					$50	$13	$97	$1	$161
22					$40	$11	$80	$1	$132
23					$40	$9	$81	$1	$131
24					$30	$7	$63	$1	$100
25					$20	$6	$44	$1	$71
26					$20	$5	$44	$1	$70
27					$20	$4	$44	$1	$69
28					$10	$3	$24	$1	$37
29					$10	$3	$24	$0	$38
30					$10	$2	$24	$0	$36
31					$10	$2	$25	$0	$37
32					$0	$1	$1	$0	$2
33					$0	$1	$1	$0	$2
TOTAL	**$50**	**$250**	**$1,050**	**$660**	**$2,140**	**$567**	**$3,603**	**$35**	**$8,355**

TABLE 16: FEDERAL CORPORATE INCOME TAX ESTIMATE (millions of 2015 dollars)											
Year	Gross Revenue	Seismic Surveys	Exploration Wells	Platforms	Development Wells	Operating Costs	Royalties	Property Tax	Total Costs	Pre-Tax Income	Corp Inc Tax
1	$0	$3	$57	$0	$0	$0	$0	$0	$60	-$60	-$21
2	$0	$6	$62	$0	$0	$0	$0	$0	$67	-$67	-$24
3	$0	$7	$47	$0	$0	$0	$0	$0	$54	-$54	-$19
4	$0	$7	$50	$0	$0	$0	$0	$0	$57	-$57	-$20
5	$0	$7	$15	$0	$0	$0	$0	$0	$22	-$22	-$8
6	$0	$7	$11	$0	$19	$0	$0	$2	$39	-$39	-$14
7	$92	$7	$6	$50	$62	$10	$12	$2	$149	-$57	-$20
8	$526	$4	$3	$136	$90	$58	$66	$2	$359	$167	$58
9	$1,073	$1	$0	$147	$121	$120	$134	$2	$525	$548	$192
10	$1,719	$0	$0	$155	$133	$188	$215	$2	$693	$1,026	$359
11	$2,500	$0	$0	$161	$84	$266	$313	$2	$825	$1,675	$586
12	$2,769	$0	$0	$124	$79	$285	$346	$2	$836	$1,934	$677
13	$3,144	$0	$0	$106	$35	$311	$393	$2	$847	$2,297	$804
14	$2,835	$0	$0	$78	$22	$273	$354	$2	$729	$2,106	$737
15	$2,385	$0	$0	$47	$10	$224	$298	$2	$581	$1,804	$632
16	$2,036	$0	$0	$31	$5	$186	$255	$2	$478	$1,558	$545
17	$1,673	$0	$0	$16	$1	$149	$209	$1	$376	$1,298	$454
18	$1,429	$0	$0	$0	$0	$124	$179	$1	$304	$1,125	$394
19	$1,178	$0	$0	$0	$0	$100	$147	$1	$249	$930	$325
20	$1,048	$0	$0	$0	$0	$86	$131	$1	$218	$830	$291
21	$778	$0	$0	$0	$0	$63	$97	$1	$161	$617	$216
22	$643	$0	$0	$0	$0	$51	$80	$1	$132	$511	$179
23	$648	$0	$0	$0	$0	$49	$81	$1	$131	$517	$181
24	$500	$0	$0	$0	$0	$37	$63	$1	$100	$400	$140
25	$351	$0	$0	$0	$0	$26	$44	$1	$71	$280	$98
26	$353	$0	$0	$0	$0	$25	$44	$1	$70	$283	$99
27	$356	$0	$0	$0	$0	$24	$44	$1	$69	$287	$100
28	$189	$0	$0	$0	$0	$13	$24	$1	$37	$152	$53
29	$194	$0	$0	$0	$0	$13	$24	$0	$38	$156	$55
30	$192	$0	$0	$0	$0	$12	$24	$0	$36	$156	$55
31	$197	$0	$0	$0	$0	$12	$25	$0	$37	$160	$56
32	$7	$0	$0	$0	$0	$1	$1	$0	$2	$5	$2
33	$7	$0	$0	$0	$0	$1	$1	$0	$2	$5	$2
TOTAL	**$28,823**	**$50**	**$250**	**$1,050**	**$660**	**$2,707**	**$3,603**	**$35**	**$8,355**	**$20,468**	**$7,164**

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Appendix F: Response to Comments

Section 1: Response to Comments
Section 2: Hearing Transcripts
Section 3: Public Comments

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Table of Contents

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Introduction

BOEM produced a Draft EIS to provide analysis of potential environmental impacts of a full range of likely activities from Lease Sale 244 if leasing, exploration, development, oil and gas production, and decommissioning were to occur. The goal of this Draft EIS was to provide the decision maker, in this case the Assistant Secretary of the Interior for Land and Minerals Management (ASLM), with relevant environmental, social, and economic information the Secretary needs to make an informed choice on whether to hold Lease Sale 244.

BOEM announced availability of the Draft EIS in the *Federal Register* on July 22, 2016 (81 *FR* 47819), commencing a 45-day public review and comment period that ended September 6, 2016. During this period, BOEM held three public hearings in Anchorage, Kenai, and Homer; additionally, all interested parties, including Federal, State, Tribal, and local governments, and the public were invited to submit written comments on the Draft EIS via the Federal eRulemaking Portal: http://www.regulations.gov. Various government agencies, organizations, and individuals provided comments through oral testimony, in writing, or electronically. In total, BOEM received 26 individual testimonies during the public hearings and 75 comment submissions. Two of the comment submissions were form letters with 216 and 306 letters each, respectively.

This appendix and specific revisions to the Draft EIS reflected in this Final EIS provide a comprehensive response to these comments. BOEM's response to the comments involved a thorough review of both oral testimony received at public hearings and each written and electronic comment the Bureau received. BOEM grouped all relevant, substantive comments into particular ***issue categories*** identified during this review. BOEM grouped comments as they pertain to specific issues or impacts to resource areas that could result from Lease Sale 244 in the Cook Inlet.

Each issue category includes a:

- **Summary of Comments:** Defines the issue category and summarizes relevant comments.
- **Source of Comments**: Lists the types of entities (e.g. governments, tribes, organizations, other groups) that submitted comments concerning the issue category. Individual comments from the public are shown under a collective heading of "General Public."
- **Response to Comments:** Provides BOEM's collective response to the comments that constitute the particular issue.

Many of the comments BOEM received via the Federal eRulemaking Portal were identical form letters or slight variations of those form letters. BOEM provided responses for relevant and substantive comments. Responses are not always provided in instances where a submittal does not comment on the content of the Draft EIS, but instead offers a general opinion or recommends a specific decision. In some instances, BOEM provides responses to some recurring issues—even when not directly relevant to the Draft EIS—to better communicate the nature of the OCS Program and the NEPA process. Generally, those issues which received more public comments have a correspondingly lengthier response, consistent with NEPA's rule of reason.

BOEM received and considered many comments of an editorial nature; for example: suggested word changes and corrections, requests for clarification, questions regarding citations, and similar. Where appropriate, BOEM made these suggested revisions to the Final EIS, and these revisions constitute BOEM's response to those editorial comments.

All relevant, substantive comments received by BOEM during the comment period are included within this volume of the Final EIS. All comments received became part of the public record. These comments are available to the decision maker during the deliberation process when deciding between the lease sale alternatives analyzed in this Final EIS.

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Issue 1. Science-Informed Decision Making

Summary of Comments

Several comments suggested studies or additional information BOEM should consider related to decisions on oil and gas activities in Cook Inlet. One commenter alerted BOEM that their organization has spent millions of dollars on studies in Cook Inlet and that information was available to BOEM. Another commenter commented on BOEM's interpretations of several reports where Cook Inlet Region Citizen's Advisory Council (CIRCAC) was an active participant in the research, stating the Draft EIS made generalizations not supported by the original report. Other comments included:

- BOEM should review the best scientific information available for establishing thresholds for assessing impacts to biological resources and use the best scientifically available thresholds; BOEM should consider holding a national workshop on this issue.
- DOI and BOEM should use the scientific definition of a biological population to achieve goals and policies (e.g., scientific integrity standards) and analyze impacts to populations and metapopulations.
- One comment requested a comprehensive listing of all studies BOEM has undertaken or proposed for the Cook Inlet, how BOEM incorporates the findings from the studies into the analyses, and requests that any information gaps identified in public comments are incorporated into future studies proposals.
- BOEM should consider potentially collaborating with the Alaska Native Harbor Seal Commission and/or the Alaska Sea Otter and Steller Sea Lion Commission to test for polycyclic aromatic hydrocarbon (PAH) levels in tissue samples from animals collected within Cook Inlet.
- In reference to the BOEM study, "Coastal Habitat Maps: Closing Spatial Gaps in ShoreZone Imagery and Data for the Cook Inlet Area," BOEM should take advantage of the data already collected by NOAA, AOOS, and CIRCAC in reference to Coastal Habitat Maps.
- Concerns expressed over the potential loss of subsistence resources from contamination in the Cook Inlet should be addressed in future research, and additional partnerships related to this issue should be considered; existing research already identifies species that BOEM could consider focusing on for several Cook Inlet communities.

Source of Comments

- Citizen Advisory Councils
- Tribal Governments
- General Public

Response to Comments

Use of Science in Decision-making. BOEM has prepared this Final EIS to inform the public and the decision-maker about the environmental impacts that could occur if Lease Sale 244 is held. The Final EIS is based on comprehensive review of existing literature, with appropriate emphasis on peer-reviewed scientific studies. A list of studies, reports, and other materials utilized in developing the Final EIS is provided in the Literature Cited, Chapter 7. BOEM has determined that existing data concerning Cook Inlet resources and the potential effects of oil and gas activities are sufficient to inform the effects analysis and facilitated a reasoned choice among lease sale alternatives. As always, BOEM will continue to actively seek new scientific information from a variety of sources in order to further inform its reviews of any proposed oil and gas activities which may result from Lease Sale 244.

The Final EIS employs commonly used scientific definitions to assess potential population level effects. The introductory material in Chapter 4 has been modified to clarify important definitions and further explain BOEM's analytical approach. In response to comments, certain text within the Final EIS (particularly within Chapter 3) has been modified to better reflect the findings made in source materials.

BOEM's Environmental Studies Program. Though a comprehensive listing of studies proposed or undertaken in Cook Inlet by BOEM is beyond the scope of the NEPA process, this information can be found in BOEM's Alaska Annual Studies Plan. This plan, beginning with the 2009 edition, is posted on the BOEM website.

Development of the Alaska Annual Studies Plan follows a longstanding and well-established process that begins with a public call for suggestions about new information needs. In addition to posting on the BOEM website, this call is delivered directly to more than 200 partner and stakeholder groups across Federal, State, Alaska Native, Tribal, academic, and industry sectors spanning international, regional, and local interest groups. Study profiles received each year from interested parties, including scientists, stakeholders, partners, and the public, undergo an organized peer-review process by scientists throughout BOEM to evaluate the priority and quality of each proposed study. For all proposed studies that are deemed relevant and of high scientific quality, final funding determinations are based primarily on the priority of the information need relative to data already available and budget limitations. Though beyond the scope of the current NEPA process, BOEM will include specific study suggestions received in public comments for consideration in our upcoming studies planning cycle for fiscal year 2018.

BOEM is conducting the study "Coastal Habitat Maps: Closing Spatial Gaps in ShoreZone Imagery and Data for the Cook Inlet Area," also called "ShoreZone along the Alaska Peninsula," in coordination with NOAA's ShoreZone project. The objective of this project is specifically to survey portions of the coastline that were not included in the recent work by CIRCAC.

BOEM has recently entered into a collaborative project with the Alaska Native Tribal Health Consortium entitled "Community Based Monitoring: LEO Network." The objective of this study is to identify and promote pathways for incorporating observations and real time documentation in the coastal northern Alaska and Cook Inlet regions through expansion of the Local Environmental Observer (LEO) Network.

Issue 2. Public Outreach

Summary of Comments

Various comments took issue with the public review and comment period provided for the Draft EIS.

There were several requests to extend the commenting deadline beyond the 45 days from publication of the notice of availability in the Federal Register to provide more time for community input, to protect the public interest, and to allow meaningful consideration of the Draft EIS. These comments asserted that 45 days is an inadequate time to review a nearly 1,200-page technical document, especially during the summer commercial, recreation, subsistence and personal use fishing season or field seasons for scientific research. The comments stated many community members are unavailable to read and respond to the Draft EIS before the deadline, placing a burden on the Alaskan public that is unreasonable. One commenter thought the stakeholders who know the most about the Cook Inlet environment are those least likely to be able to fully participate since they are out working in, researching, and managing its habitats and resources.

Several comments noted that additional time would:

- give the public time to more thoroughly understand the important and complex interrelationships in the Cook Inlet's natural environment.
- allow for a thorough examination of the Draft EIS by people familiar with the Cook Inlet area so that the assumptions and interpretations made for the various analyses and alternatives can be evaluated.

Some comments expressed frustration about being obligated to comment on potential offshore drilling yet again.

Some comments suggested ways that BOEM can improve its outreach efforts, such as allowing for an interactive public hearing.

Source of Comments

- General Public
- Environmental Non-Governmental Organizations
- Citizen Advisory Councils

Response to Comments

Please see Chapter 6 of the Final EIS for a description of BOEM's extensive outreach efforts during the development of the EIS. Additional responses are below.

Seeking Comments. Even when some stakeholders have objected to the prospect of OCS leasing, exploration, or development in the past, BOEM must carry out its responsibilities under NEPA and the OCSLA which include specific opportunities for comment at certain stages. Under NEPA, BOEM must solicit and gather public input during preparation of every EIS. BOEM chose to focus on gathering public testimony during public hearings on the Draft EIS and not conduct an interactive hearing. At this stage of public review, BOEM used a hearing format to directly receive comments specifically focused on the Draft EIS. The purpose of the public hearing is different than public scoping that typically addresses more general concerns and questions about a project and is more interactive. The public hearing format ensures that all members of the public have a fair and equal opportunity to provide their specific input regarding the Draft EIS. The hearing format also allows for the development of a transcript that accurately captures all of the testimony and can easily be made available to the public as part of the Final EIS.

Availability and Efforts to Notify the Public. BOEM took deliberate steps to announce the availability of the Draft EIS, to disseminate the Draft EIS, to meet with interested parties, and to publicize the series of meetings scheduled specifically for this process. These efforts included the following:

- Publishing a Notice of Intent in the Federal Register on November 23, 2014, to Prepare the EIS (79 *FR* 63437). The NOI identified three methods by which the public could provide scoping comments or suggestions regarding the Lease Sale 244 EIS: in person at public scoping meetings, in writing at public scoping meetings, or by electronic comment submittal at www.regulations.gov. Scoping Meetings were held in Seldovia, Nanwalek, Homer, Soldotna and Anchorage.
- Publishing a Notice of Availability of a Draft EIS on July 22, 2016 (81 *FR* 47819).
- Updating BOEM's website and providing a link to the Draft EIS (link added on July 15, 2016).
- Mailing hard copies of the Draft EIS to Tribal and local governments, local libraries, and other parties who expressed interest in BOEM NEPA documents (Mailed on July 22, 2014).

- Scheduling a series of meetings with both Tribal and local governments in and around Cook Inlet.
- Placing large newspaper ads to appear in two editions each of the *Peninsula Clarion, Homer News,* and *Alaska Dispatch News*.
- Running public service messages on the selected radio stations serving the southcentral Alaska in Homer, Kenai and Anchorage and, providing the same messages to commercial radio station KBBI (broadcast in several communities of southcentral Alaska).
- Providing our community advisories to news media assignment editors from at least two dozen radio and television stations and newspapers in the Anchorage, Homer and Kenai/Soldotna area (including the Alaska Public Radio Network), and thereby encouraging their possible follow-up with additional announcements or stories.
- Using social media, such as BOEM's Facebook page and Twitter, to inform the public of the agency's efforts.

BOEM Alaska OCS Region sends notification of all new NEPA documents to all persons who have signed up for its distribution list.

Requests to Extend the Time to Comment. CEQ regulations require BOEM to provide a minimum 45-day public comment period on the Draft EIS. The EIS tiers from the 2012-2017 Programmatic Final EIS that already considered these issues and allowed for and incorporated public comment. The Lease Sale 244 Request for Information (RFI) process allowed for public comment and resulted in substantial reduction of the proposed Lease Sale Area. The impacts from and/or issues concerning oil and gas activities in Cook Inlet are well-known given the history of development (in state waters and adjacent uplands) and the multiple NEPA documents BOEM has completed in the region. There have been many BOEM/BOEMRE /MMS as well as NMFS, USFWS, and EPA reviews of activities in Cook Inlet.

The proposed Lease Sale area considered is quite small relative to the planning area and other lease sales in the past. There are still opportunities for government-to-government consultation. There will be more opportunity for public review and comment prior to approving any EPs or DPPs.

The Draft EIS comment period provided a meaningful and ample period of time to comment on the document. In addition to accepting written comment, BOEM accepted comment at three public meetings held around Alaska, including major population centers and communities near the proposed Lease Sale Area. BOEM communicated key concepts to the public at the public meetings using PowerPoint presentations.

BOEM considered each individual request for an extension to the comment period. BOEM determined the 45-day comment period, however, provided adequate time for receipt of comments on the document. BOEM weighed the Department's operational needs as well as the requests for additional time and determined that, balancing these considerations, the existing comment period was sufficient and additional time was unlikely to result in significant additional comments. BOEM called each requester to let them know the determination not to extend the comment period. The requesters who asked for an extension of time did submit comments on the Final EIS.

Issue 3. Alternatives

Summary of Comments

Many of the comments received on the Draft EIS expressed a preference as to which lease sale alternative should be selected or that several alternatives should be combined as a selection. Several commenters also expressed dissatisfaction with the range of alternatives and requested additional alternatives, including: protective alternatives for both listed and non-listed species, an alternative that would exclude critical habitat for more than one species, an alternative that would delay Lease Sale 244 until more information is known about the threats to beluga whales, and an alternative that would otherwise limit development and production activities (such as number of wells drilled or prohibition of fracking and acidizing). One commenter stated Alternative 3C arbitrarily fails to prohibit exploratory drilling during certain seasons. Another commenter felt that alternatives are weakened by allowing waivers to or variances from protective stipulations where lessees propose “commensurate” adaptive management strategies. Some suggested alternatives for limiting the amount or timing of oil and gas exploration or development, or for increasing renewable energy production in Cook Inlet. One comment stated that BOEM should have considered an alternative that would delay Lease Sale 244 until more information is known about threats to beluga whales.

Two comments questioned the Draft EIS finding that all of the action alternatives are presumed to entail the same amount of oil and gas activity. One stated this finding disregards the cumulative effects of alternatives other than the Proposed Action and prevents a comparison of the full impacts of the various alternatives proposed. Another stated that this finding suggests “the action alternatives are not really alternatives at all.”

The State of Alaska requested clarification on the reasoning behind Alternative 6 (zero discharge of drilling fluids and drill cuttings in the lease area): “a comparison of the impacts indicates that there was little additional mitigated impact from eliminating the discharge when compared to the proposed alternative.” The EPA noted that their regulations allow the discharge of drilling fluids and cuttings in the OCS and asked BOEM to consider this in light of the discharge prohibitions outlined in Alternative 6.

Source of Comments

- Environmental Non-Governmental Organizations
- General Public
- Federal Government
- State Government
- Industry Non-Governmental Organizations

Response to Comments

Opinions and Recommendations. Comments that express general opinions or recommend specific decisions to be made by the Secretary of the Interior will be incorporated into the administrative record and available to the decision maker during the deliberative process for Lease Sale 244. BOEM will not provide specific responses to such comments.

Agency’s Preferred Alternative. Under NEPA, an agency’s preferred alternative frequently takes into account factors beyond the environmental effects analysis contained within the document itself. Departmental regulations at 43 C.F.R. 46.420(d), which implement CEQ regulations at 40 C.F.R. 1502.14(e), describe the agency’s preferred alternative as “the alternative which the agency believes would fulfill its statutory mission and responsibilities, giving consideration to economic, environmental, technical and other factors.” As noted in the Draft EIS, Section 2.2 (Alternatives), “Although the alternatives are analyzed separately in the EIS, the Secretary’s decision could incorporate elements of multiple alternatives.” Due to this option to select aspects of multiple alternatives, it was not necessary for BOEM to include a separate alternative combining exclusion of both beluga and sea otter critical habitat. In this Final EIS, BOEM identifies the preferred alternative as a combination of the Proposed Action (Alternative 1) with several of the alternatives (Alternatives 3B, 3C, 4B and 5); BOEM feels that this combination of alternatives best protects environmental resources while meeting the purpose and need of the Proposed Action. While this is the Preferred Alternative identified in the Final EIS, consistent with 43 CFR 46.420, it is not the final decision on whether and how to proceed with Lease Sale 244. That decision will be made by the ASLM and announced in a Record of Decision and Final Notice of Sale, if the decision is made to proceed with a sale.

Range of Alternatives. NEPA does not require consideration of a set number of alternatives; instead, the range of alternatives is based upon a rule of reason (CEQ, 1981). While innumerable alternatives could be created, the action alternatives developed for the Lease Sale 244 EIS provide a reasonable range of alternatives for analysis and comparison of reasonably foreseeable impacts of the Proposed Action and these alternatives for the public and decision maker. Section 2.3 discusses alternatives considered but not analyzed further, as they were not useful for analysis, or did not meet the purpose and need for this EIS. BOEM considered each of the alternatives proposed in the received comments and determined that the existing range of alternatives is reasonable.

Further information regarding proposed exploration or development and production activities would be identified in an EP or a DPP which a lessee would submit prior to conducting exploration or development activities, and the impacts analyzed prior to permitting decisions being issued per the requirements of NEPA. If necessary to avoid undesirable impacts, BOEM would develop reasonable alternatives to each proposal and may require plan revision to meet regulatory requirements.

Various portions of the EIS acknowledge where potential effects of oil and gas development and production would be similar under each action alternative. Such conclusions are attributable to the assumption that the same level of exploration, development, and production activities would occur under each alternative, as well as the inherent uncertainty at the lease sale stage regarding the exact location of future development and production activities. It is impossible to know, until specific exploration plans are submitted and approved and commercial discoveries made, where exactly any exploration and development activities and their resultant effects will occur.

Considering the multi-staged nature of the OCS development approval process established by Congress through OCSLA (see Section 1.3.1), additional mitigation measures like time and area restrictions become identifiable upon proposal of a specific activity, e.g., an exploration plan.

Regarding an alternative that would delay Lease Sale 244 until more information is known about beluga whales, Section 2.3.1 of the Final EIS describes the "Postpone Lease Sale" alternative, which was considered but not analyzed in detail. BOEM determined that this alternative is equivalent to the No Action alternative for purposes of evaluating potential impacts, and including this as a separate alternative would not be useful to the decision maker or the public.

Renewable Energy. Comments asserting a preference for other energy sources are beyond the scope of the current analysis. Alternatives to OCS oil and gas leasing to meet the Nation's energy needs is a programmatic issue, which is addressed in Section 2.6.4 of the Final EIS for BOEM's 2017-2022 Five-Year Program (USDOI, BOEM, 2016). The DOI and BOEM continue to move forward on renewable energy. More information on the OCS Renewable Energy Program is available at: http://www.boem.gov/Renewable-Energy/.

Alternative 3C. Several comments voiced concern about Alternative 3C not offering enough protection to beluga whales. Alternative 3C builds on rationale used in recent IHAs concerning oil and gas activities in Cook Inlet, by expanding a 10-mile restricted area concept to the anadromous streams near the proposed Lease Sale Area that may function as feeding areas for beluga whales. While developing the draft EIS, BOEM identified few potential impacts to belugas associated with exploration drilling but greater potential impacts to beluga from seismic surveys, and thus reasonably elected not to include a drilling prohibition as it developed this additional, tailored mitigation measure. Further, the analysis of Alternative 3B already indicates that exploration drilling noise is not likely to cause Level B harassment to beluga whales. Such harassment is more likely to be caused by seismic surveys; thus, Alternative 3C proposes to reduce potential impacts by restricting seismic surveys when and where belugas are most likely to be present. Further details about BOEM's rationale for Alternative 3C are in Section 2.2.3.

NMFS may identify additional mitigation measures to protect beluga whales as part of a Biological Opinion developed through ESA, Section 7 consultation with BOEM. NMFS may also incorporate additional mitigation measures into any incidental take authorizations (i.e. Letters of Authorization (LOAs) or an Incidental Harassment Authorizations (IHA)) issued pursuant to the MMPA and its implementing regulations.

Alternative 6. BOEM developed this alternative (Prohibition of Drilling Discharges) in response to comments concerning discharges received during the scoping period for Lease Sale 244. During scoping, nearly all commenters called for "zero" drilling discharges (including waste, all drilling fluids, drilling cuttings, and polluted wastewater) as a condition of leasing. Many commenters cited contaminant studies suggesting that many foods may no longer be safe to eat, or to raise (in the case of shellfish/oyster farms in Kachemak Bay). One commenter expressed concern over an EPA waiver in Cook Inlet that permits toxic discharge prohibited elsewhere in the U.S. and the impacts of these toxic discharges to an approved shellfish growing area. Commenters suggested that Cook Inlet was the only place in national waters that does not have restrictions, stating Cook Inlet was the first place in the State to produce oil and there has been oil development and dumping without regulation since that time. Therefore, understanding that EPA regulations allow for such discharges, BOEM developed Alternative 6 as an alternative to analyze these concerns further.

Stipulation waivers. BOEM would allow lessees to request a waiver to or variances from certain protective stipulations at the time of filing an exploration or a development and production plan with the RSLP; lessees must propose commensurate adaptive management strategies, and must analyze the effectiveness of those methods. In order for a waiver to be approved, the RSLP must find that proposed measures do meet the level of protection provided by the stipulation; the proposed measures would not be approved if they did not meet this requirement. Thus, BOEM does not consider the waiver provisions to "weaken" the protections offered by the stipulations. They instead allow for adaptive management of oil and gas activities that takes into account current information about potentially affected environmental resources.

Issue 4. Mitigation

Summary of Comments

Some commenters expressed concern about the efficacy of proposed mitigation measures, and whether and how monitoring would be conducted. A few others proposed new mitigation and monitoring measures to prevent the introduction of aquatic invasive species. Another commenter requested BOEM consider additional mitigation measures to protect beluga whales by restricting lease activities during migratory, breeding, and calving periods.

Source of Comments

- General Public

Response to Comments

BOEM included appropriate mitigations in their analyses. If chosen they will have a monitoring and enforcement program. Secretarial Order 3330, "Improving Mitigation Policies and Practices of the Department of the Interior," (Oct. 31, 2013) established a Department-wide mitigation strategy to ensure consistency and efficiency in the review and permitting of infrastructure development projects and in conserving valuable natural and cultural resources. Central to the strategy is (1) the use of a landscape-scale approach to identify and facilitate investment in key conservation priorities; (2) early integration of mitigation considerations in project planning and design; and (3) ensuring durability of mitigation measures.

In developing the EIS, BOEM identified various ways in which potential impacts could be reduced. These potential mitigation measures are identified and analyzed in the Final EIS. BOEM also considered all relevant and reasonable mitigation measures identified in public comments on the EIS. Decisions on whether to adopt specific mitigation measures will be made in the Record of Decision. Proposed mitigations concerning later stages of the OCSLA process will be taken under advisement and considered in subsequent NEPA analyses.

Specific Mitigation Measures Considered. One commenter suggested BOEM require industry vessels to visually inspect their hulls to ensure the vessels are free of biofouling, and provide BOEM with a certification of such inspection. This commenter also requested a requirement for a specific sanitation process. BOEM has added a discussion of impacts of invasive species to Section 4.3.9.3 of the Final EIS and analyzed the potential environmental benefit of requiring mitigation for non-native aquatic species. The U.S. Coast Guard has regulations, policies, and standards regarding biofouling and ballast water discharge related to reducing impacts of non-native species, and standardized processes, which BOEM considered in its analysis. These requirements are included in EPA's Final 2013 Vessel General Permit and the small Vessel General Permit (sVGP), though BOEM may require additional mitigation as appropriate. Additionally, BOEM is considering a potential new mitigation measure designed to reduce GHG emissions and thus reduce impacts from the Proposed Action on climate change (see Section 4.3.1).

Issue 5. Compliance with Laws, Acts, Policies

Summary of Comments

Some commenters believed the OCSLA process offers lease sales too often. In general, these same commenters also expressed opposition to any lease sale/oil and gas development in Cook Inlet. One commenter expressed concern that subsequent NEPA done for EPs and DPPs would not incorporate public input. Other comments included concerns about monitoring of oil and gas operations, including long-term follow-up. One commenter pointed out that BOEM must engage in Section 7 consultation prior to holding the lease sale.

NMFS recommended adding language to the EIS about the Marine Mammal Protection Act (MMPA) and requirements regarding incidental take authorizations.

Source of Comments

- General Public
- Federal Government
- Environmental Non-Governmental Organizations
- Citizen Advisory Councils

Response to Comments

BOEM has added wording to Chapter 6 regarding MMPA requirements. Regarding ESA Section 7 requirements, BOEM is consulting with NMFS and USFWS for the activities that would be conducted pursuant to leases issued under Lease Sale 244. BOEM will complete this consultation prior to the issuance of a Record of Decision.

Pace of Leasing. BOEM administers OCS leasing, exploration, development, and production as mandated by the OCSLA. OCSLA provides for the "expeditious exploration and development" of the Outer Continental Shelf subject to environmental safeguards (43 U.S.C. 1332). Consequently, the pace of leasing is determined by the OCSLA provisions requiring 5-year planning intervals (43

U.S.C. 1344). Here, a programmatic decision was made to hold a sale in Cook Inlet in 2017, and this document analyzes the potential environmental impacts of such a sale. Thus, any recommendation on frequency of leasing is best suited as a comment on the Five Year program, but is outside scope of this EIS. Furthermore, given the existing requirement to assess leasing opportunities at five-year intervals, BOEM is confident in its ability to manage resources in a safe and environmentally sound manner.

Monitoring and Enforcement. No activities that could affect Cook Inlet resources would take place without appropriate regulatory oversight. BSEE maintains the option to have a continuous inspection presence during drilling operations.

Issue 6. Scope, Purpose and Need, and Impacts Scale

Summary of Comments

Many comments addressed concerns about the EIS framework or scope and compliance with NEPA. Some commenters felt the scope of analysis was too detailed or too general or otherwise not specific to the Cook Inlet, and the purpose and need of the EIS was too narrow. Other commenters were critical of the impact scale, and characterized the terminology used as ambiguous and ill-defined; or stated a more concrete link between analysis and conclusions is needed. One comment stated that any impact in the Draft EIS described as "moderate" should be grounds for support of the No Action Alternative. Another comment stated lifting of an oil export ban would inhibit meeting the Proposed Action as defined. A couple of comments requested clarification in the wording of parts of the executive summary, such as defining the lifespan of development and production associated with the proposed lease sale, and clarifying wording regarding the range of impacts. Several comments asserted a preference for analysis of alternative energy sources.

Source of Comments

- General Public
- Federal Government
- Local Government
- State Government
- Citizen Advisory Councils
- Environmental Non-Governmental Organizations

Response to Comments

The purpose of the Proposed Action analyzed in this EIS is to offer for lease certain OCS blocks located within the federally-owned portion of Cook Inlet that may contain economically recoverable oil and gas resources. The need for the Proposed Action is to further the orderly development of OCS resources in accordance with the Outer Continental Shelf Lands Act of 1953 (OCSLA, as amended (43 U.S.C. 1331 et seq.)(Section 1.1). BOEM administers OCS leasing, exploration, and development as mandated by OCSLA. Congress amended OCSLA in 1978 to provide for the "expedited exploration and development of the Outer Continental Shelf . . ." 43 U.S.C. 1802(1). OCSLA mandates are unaffected by H.R. 2029, relating to export of crude oil.

Comments asserting a preference for analysis of other energy sources are beyond the scope of the current analysis; however, Issue 25 of this appendix (Energy Policy Considerations) has more information about renewable energy, and Issue 8 of this appendix (Climate Change) discusses climate commitments and replacement energy estimates. The Proposed Action is tied to the programmatic decision already made in the 2012-2017 Five Year program to schedule a lease sale in Cook Inlet (USDOI, BOEM, 2012a). A decision to forgo Lease Sale 244 and instead focus on development of renewables is already encompassed by the No Action Alternative and is a decision the ASLM could reach in the ROD. The concept of “alternative uses of the OCS” does not currently represent a feasible means of providing a commensurate level of energy in a timely manner, given that there are currently no viable proposals for renewable energy projects on the Cook Inlet OCS.

Information in Chapters 3 and 4 of the Draft EIS, describing the affected environment and analyzing potential impacts, is intended to describe the overall condition of the Cook Inlet region, but to provide more detail on resources that could be affected by the Proposed Action and the alternatives. BOEM has added clarifying wording to Chapter 3. Twenty resources were analyzed, which individually and collectively characterize Cook Inlet.

BOEM has made clarifying wording changes in response to comments to the Executive Summary regarding the lifespan of development and production.

Impacts Scale. The CEQ regulations implementing NEPA state that an EIS should discuss the significance of the direct and indirect effects of the proposed action and the alternatives (40 CFR 1502.16). Significance is evaluated by considering the context in which the action will occur and the intensity of the action (40 CFR 1508.27).

BOEM has standardized its approach for gauging impacts by using the “Impacts Scale,” which is discussed in detail in Section 4.1.1 of the EIS. Definitions are given for each of the four components of the scale: negligible, minor, moderate, and major. The concept of significance is incorporated into the Impacts Scale. The scale takes into account the context and intensity of the impact based on four parameters: detectability, duration (i.e., short-term or long-lasting), spatial extent (i.e., localized or widespread), and magnitude (i.e., less than severe or severe, where the term “severe” refers to impacts with a clear, long lasting change in the resource’s function in the ecosystem or cultural context). In applying this scale and the terms that describe impact categories (levels of effect), analysts took into consideration the unique attributes and context of the resource being evaluated. For example, for impacts to biological resources, attributes such as the distribution, life history, and susceptibility of individuals and populations to impacts are considered, among other factors.

“Moderate” is defined by the impacts scale as having impacts that are long lasting and widespread, and less than severe. This Final EIS is not a decision document; the Final EIS presents all of the relevant information on potential impacts from the Proposed Action and alternatives to the decision maker (the ASLM) and the public. After review, considering those impacts, as well as other relevant factors (such as national policy or needs) in totality, the ASLM will decide whether and how to proceed with the sale. BOEM notes the commenter’s preference for the No Action alternative, and it remains an alternative for consideration.

The four different tiers of the Impacts Scale enables BOEM analysts to gauge the context and intensity of potential impacts with precision, thus better informing the public and the decision maker as to the intensity of impacts all on one uniform scale. Analyzing the various types and levels of impacts that may result from the various oil and gas activities that comprise the Scenario requires nuance and flexibility in the grading scale. It is BOEM’s determination that the environmental analysis is effectively presented and described by the Impacts Scale and presents the information in the most useful way for the decision maker and public.

Issue 7. Exploration and Development Scenario

Summary of Comments

Several comments question aspects of the Exploration and Development Scenario (the Scenario):

- One comment suggests that development would result in the Homer Spit looking like Nikiski.

- One commenter questioned where the gas was going to be sold.
- Several commenters suggested that existing infrastructure, including roads and buildings, is not sufficient to support exploration, development or production on the Kenai Peninsula.
- One commenter suggested that the Scenario included tankering and that Cook Inlet does not have a vessel traffic system.

Source of Comments

- General Public
- Environmental Non-Governmental Organizations

Response to Comments

Development impacts to Homer. The Exploration and Development Scenario predicts that pipeline landfall for OCS development would occur between Homer and Nikiski, i.e. north of Homer. Onshore oil and gas pipelines would then convey the produced oil and gas north to Nikiski for processing. A new processing facility constructed in Homer is not considered reasonably foreseeable because it would be expensive and unnecessary to build a pipeline to transport oil and gas south from the OCS pipeline landfall to Homer and then build another pipeline to transport oil and gas north again from Homer, past the OCS pipeline landfall, and then to Nikiski. BOEM does not anticipate any production infrastructure to be located on the Homer Spit. It would be much more cost-effective to upgrade the existing facility in Nikiski than to build a new facility farther away from Anchorage, the major market for oil and gas, than the pipeline landfall. The Final EIS considers potential impacts to Homer from development in Sections 4.3.13 (sociocultural systems) and 4.3.15 (recreation, tourism and visual resources).

Gas Market. Section 2.3.7 of the Final EIS states that the gas produced as a result of the proposed Cook Inlet Lease Sale 244 would be consumed in Southcentral Alaska, where local demand generates a higher price for natural gas than in the rest of the United States. This is the same marketing strategy used for the current gas production from the Alaska state waters in the Cook Inlet and from the onshore Kenai Peninsula.

Existing Cook Inlet infrastructure. Onshore discovery was in 1957 with production in the Kenai Peninsula beginning at Swanson River in 1959, and production from the state waters of the Cook Inlet began in 1967. There are currently 17 offshore platforms in the state waters of Cook Inlet, 13 of which are active. The Exploration and Development Scenario estimates an additional 2 to 3 platforms to be built in Federal waters if oil and gas were discovered and developed as a result of proposed Lease Sale 244. This additional activity would be a modest increase in the existing oil and gas activity levels. The only new onshore infrastructure requirements predicted are additional onshore oil and gas pipelines to transport production. Some increase in traffic on local roads would occur, particularly during the exploration and development stages when drilling supplies may be transported by land to be carried by boat or helicopter to a drilling rig or to a platform. The volume of supplies needed during the production phase would be much less. BOEM anticipates that pipelines, not trucks, would transport oil to Nikiski.

Tankering and vessel traffic. Section 2.3.7 of the Draft EIS stated that tankering of OCS oil and gas was considered by BOEM but not carried forward for full analysis in the EIS. This discussion has been moved to Section 2.4 of the Final EIS. That section explains why tankering is not a reasonably foreseeable transport strategy in this instance. Pipelines are the proven oil and gas transportation method for potential development. Using massive tankers to transport oil from the platforms in Cook Inlet to the oil refinery sixty miles south of Anchorage would be comparatively expensive and impractical. If tanker loadouts were delayed, production shut downs would be required if platform storage vessels were full. Natural gas cannot be tankered unless it is first transported to a plant and compressed and cooled to create liquefied natural gas (LNG). Therefore, BOEM analyzed the transportation of produced gas from the platforms to the Kenai LNG plant by pipeline.

Issue 8. Climate Change

Summary of Comments

Several comments noted specific effects of climate change already affecting Alaska and the Cook Inlet region, including noticeable changes in seasonal temperatures, wildlife and fishing patterns, coastal erosion, increased storm severity, and a host of other changes. One comment questioned the finding of a potential 2021 Cook Inlet lease sale as having the same effects as the Proposed Action, stating that the effects of a lease sale farther into the future could potentially cause greater harm as the region continues to warm. BOEM heard testimony at its public hearings emphasizing the importance of considering climate change in its NEPA analysis. One public hearing attendee stated, "Here in Alaska we are on the forefront of climate change. It's really noticeable. I wish everybody in the world that didn't believe in climate change could come to Alaska…" Another attendee expressed the opinion that "climate change is the most pressing threat that we have as a people…"

Other comments asserted that that the No Action alternative is flawed because of the assumption that oil production forgone by leasing would be made up by imports of oil or that that the oil produced would be used domestically and not exported. Comments suggested that BOEM overestimated the amount needed to offset the forgone production; and that BOEM ignores the reduction in production of fossil fuels to achieve the country's commitment to reduce GHG emissions.

Specific suggestions or criticisms concerning the Draft EIS include the following:

- The Draft EIS largely fails to meaningfully integrate climate change into the direct, indirect, and cumulative effects analysis.
- BOEM must follow the newly released guidance from CEQ regarding the analysis of greenhouse gas emissions and climate change in NEPA documents.
- The Draft EIS does not sufficiently analyze the increasing threats of ocean acidification to Alaska's marine ecosystems.
- BOEM must assess the potential climate change effects of the combustion of oil and gas produced because of future OCS lease sales in Cook Inlet.
- BOEM is obligated to support U.S. foreign policy goals associated with climate change, particularly the Paris Agreement. The larger issue of decreasing global CO_2 emissions necessitates that unproven resources on the OCS must remain undeveloped to meet these goals and reduce the rate of global climate change.
- BOEM should evaluate the social cost of carbon in its analysis of economic impacts.
- The EIS should acknowledge how climate change will impact oil and gas infrastructure in the Cook Inlet.
- The Draft EIS failed to analyze the impacts of black carbon emissions.

Source of Comments

- General Public
- Federal Government
- State Government
- Environmental Non-Governmental Organizations

Response to Comments

BOEM shares concerns about climate change and the many unique challenges facing Alaska. The Final EIS addresses these concerns in several ways.

Overview of how the Final EIS considers GHG emissions and Climate Change. The Final EIS provides a multi-faceted, comprehensive analysis of climate change issues. Chapter 3 first explains the mechanisms of climate change and describes how climate change is affecting environmental resources around the world. This discussion acknowledges the primary role of anthropogenic factors, such as fossil fuel combustion, in causing climate variability. This discussion also describes ongoing policy initiatives designed to reduce GHG emissions, and how the decision to be made on Lease Sale 244 relates to those larger initiatives. The Final EIS goes on to describe in greater detail how climate change is affecting Alaska in particular, incorporating information from authoritative climate reports such as the Third National Climate Assessment. It is acknowledged that Alaska has warmed twice as rapidly as the rest of the United States, resulting in pronounced impacts including widespread glacier retreat, warmer permafrost, earlier spring snowmelt and drier landscapes, and increased numbers of invasive species and fires. The issue of ocean acidification and its ramifications to Alaska's marine food webs is also highlighted and discussed.

The Final EIS also analyzes the Proposed Action's contribution to climate change. All GHG emissions directly or indirectly attributed to the Proposed Action are quantitatively estimated to provide a proxy for assessing potential contributions to climate change. This includes not only projected "upstream" GHG emissions from oil and gas activities described in the hypothetical Exploration and Development Scenario, but also projected "downstream" GHG emissions from the consumption of oil and gas produced from Lease Sale 244 leases. The Final EIS also estimates the social cost of emitting these GHG emission and describes how these estimates should be considered in the decision-making process.

The Final EIS goes on to consider the other direct, indirect, and cumulative effects of the Proposed Action within the context of this changing environment. As recommended in CEQ's guidance, the analysis focuses on those aspects of the environment that could be impacted by both the Proposed Action and climate change, and identifies several instances where the direct and indirect impacts from the Proposed Action may be worsened or otherwise influenced by climate-related changes. The potential impacts on the Proposed Action (i.e. oil and gas activities and infrastructure in and around Cook Inlet) from climate change are also discussed.

Additionally, BOEM is considering a potential new mitigation measure designed to reduce GHG emissions and thus reduce impacts from the Proposed Action on climate change (see Section 4.3.1), as recommended by CEQ guidance. Consistent with adaptive management principles, BOEM may develop additional climate change mitigations on a project-specific basis in the future, as climate change effects are better understood. BOEM will identify, analyze, and potentially require appropriate measures to mitigate climate-related impacts during any subsequent EP and DPP approval process.

Incorporating New Information. The more comprehensive analysis of climate change issues that appears in the Final EIS (as compared with the Draft EIS) results from consideration of public comments as well as important new information becoming available. In particular, two important documents relevant to BOEM's analysis of GHG emissions and climate change became available after the Draft EIS was released, but prior to release of this Final EIS.

On August 1, 2016, CEQ issued Final Guidance for the Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews. The Final EIS addresses the effects of climate change consistent with the recommendations provided by CEQ in its Final Guidance.

BOEM also finalized a new technical report (included as Appendix G to this Final EIS), that allows the agency to quantify the potential downstream greenhouse gas emissions and the social cost of carbon. The document, "OCS Oil and Natural Gas: Potential Lifecycle Greenhouse Gas Emissions and Social Cost of Carbon" was prepared to inform BOEM's review of activities associated with its 2012-2017 OCS Program and potential 2017-2022 Programmatic oil and gas activities but is readily applicable here (Wolvovsky and Anderson, 2016). This document provides methodologies for quantifying GHG emissions that are tailored to OCS operations associated with oil and gas leases (exploration, development, and production), the onshore processing (refining, storing), the delivery of these products to the final consumer, and then the consumption of the oil and gas products. This document also contains methodologies which allow BOEM to quantitatively estimate the social cost of emitting this carbon.

Emissions from "downstream" consumption. The Draft EIS acknowledged that greenhouse gases would be emitted by consumption of oil and gas produced as a result of Lease Sale 244, and that these GHG gases would contribute to climate change. The Draft EIS did not, however, attempt to quantify these "downstream" or lifecycle emissions. Since that time, BOEM has developed a tool for estimating lifecycle GHG emissions (Section 4.3.1.1) from OCS activities. This tool enabled BOEM to include in the Final EIS a quantification of GHG emissions associated with combustion of oil and gas produced as a result of Lease Sale 244.

BOEM originally developed these methodologies to better understand potential environmental impacts associated with its Draft 5-Year Plan for 2017-2022. Every five years BOEM proposes a national program of leases for the outer continental shelf for oil and gas development, and recently built an analytical model to estimate the combined upstream and downstream GHG emissions for OCS oil and gas resources for its 2017-2022 Programmatic EIS. The model and its calculations are subject to a number of assumptions, which are explained in detail in a separate technical report on greenhouse gas emissions (Wolvovsky and Anderson, 2016), which is incorporated by reference in the Final EIS.

Using numbers generated by this model and its underlying assumptions, BOEM Alaska Region developed estimates for GHG emissions associated with the combustion of oil and gas resources that may be produced as a result of Lease Sale 244 and the No Action alternative. These estimates are contained in Section 4.3.1.1. These numbers take into account the total projected GHG emissions for the 40-year lifecycle for development, production and consumption of hydrocarbons resulting from Lease Sale 244. The No Action alternative accounts for the substitution of fossil fuels as well as decreased domestic consumption. Impacts from these downstream emissions are accounted for in the Final EIS's larger analysis of climate change effects.

The Social Cost of Carbon. BOEM has adopted the approach of the Interagency Working Group on Social Cost of Carbon to estimate the social cost of carbon, and estimated the social cost of carbon in the above-mentioned technical report. As with the previously discussed "downstream emissions," BOEM used the methodology developed for its 2017-2022 Programmatic EIS to develop an estimate of the social cost of carbon (SCC) for the Proposed Action. Section 4.3.10 of the Final EIS provides a quantitative estimate of the SCC associated with oil and gas that could be produced from Lease Sale 244 leases. Explanation of how this estimate was derived and how this estimate is to be appropriately considered in the decision making process is also provided.

Direct, Indirect and Cumulative Effects of the Proposed Action. BOEM's consideration of climate change begins in Chapter 3 with a robust discussion of climate change, its causes, and its potential influence on a dynamic Alaska environment. The Final EIS contains additional detail concerning climate change impacts, including ocean acidification, in Alaska and on resources in the Cook Inlet region.

BOEM has also expanded its analysis of how the impacts of the Proposed Action could be influenced by climate change. BOEM has revised the cumulative effects analysis to provide more context and support for conclusions about any incremental contribution to potentially significant cumulative effects. The description of the cumulative effects of climate change in Section 5.1.2.13 describes how impacts from climate change can combine with impacts from the Proposed Action to affect the Cook Inlet region. BOEM then analyzes these cumulative effects within each individual resource or species.

The level of analysis in the Final EIS complies with recent CEQ guidance and is an appropriate level of detail for the decision at hand. Judgments concerning the probability of future impacts should be informed. It is not presently possible for science to predict with confidence what precise (i.e., fine-scale) geographical changes to species distribution and habitat use may occur over long time scales and as the result of climate change. Therefore, certain characterizations in both Chapter 4 and 5 of how climate change will affect the environment and influence direct, indirect, and cumulative impacts of the Proposed Action over time are necessarily broad.

Ocean Acidification. The concept of ocean acidification is explained in Chapter 3 and incorporated into the effects analyses for several resources in Chapters 4 and 5.

Black carbon. Black carbon emissions, which are less impactful in the Cook Inlet region than the Arctic, are estimated through a conservative approximation of Fine Particulate Matter ($PM_{2.5}$) and analyzed in Section 5.2.1.

BOEM disagrees with comments that suggest any additional contribution of GHG from the Proposed Action would lead to irreversible problems and costs caused by climate change. Recent papers advocating that all undiscovered hydrocarbon deposits must remain undeveloped in order to avoid significant impacts and/or to meet global climate change goals are noted, but it is important to distinguish between science and policy.

The categorization of a resource as either “undiscovered” or “discovered” simply reflects the degree to which their presence has been verified by exploration activities. These designations do not reflect the capacity of that resource to emit GHGs if produced and consumed. The amount of GHG emissions that can be attributed to an oil or gas resource is instead dependent on the physical composition of the resources, along with how it is developed and eventually consumed. There is no valid scientific reason to distinguish between "undiscovered" resources and "discovered" resources when analyzing potential GHG emissions and climate change effects in an EIS.

While foregoing development and consumption of all resources currently designated as “undiscovered” could be one strategy of limiting global emissions and thereby curbing additional climate change impacts, it is not the only strategy. In fact, development and production of oil and gas resources presently categorized as "undiscovered" could actually have a net benefit to climate policy objectives if such production displaces consumption of other resources such as coal that have higher GHG emissions potential. Any objective discussion of any resource's contribution to global GHG emissions must take into account this “substitution effect,” which is addressed in Wolvovsky and Anderson, 2016.

No Action Alternative. The No Action Alternative is equivalent to cancellation of the Proposed Action (Section 2.2.2). Several comments suggested that the No Action Alternative was flawed because BOEM overestimated the amount of oil imports needed to offset the forgone production; and that BOEM ignores the reduction in production of fossil fuels to achieve the country’s commitment to reduce GHG emissions.

The substitution figures contained in the No Action Alternative are derived from programmatic agency analyses of these concepts, which used updated models (Wolvovsky and Anderson, 2016). The assumptions and rationale for using these models is described therein. Additionally, that Report acknowledges and provides multiple (i.e. a “high” and a “low”) climate scenarios as recommended in

CEQ's 2016 guidance. Moreover, if climate change is in fact curtailed in the future via international agreements, then the reduction of impacts would occur across all alternatives, not just under the No Action Alternative, thus minimizing the difference in environmental impacts as between the No Action and action alternatives.

Continuing Review. As is explained in Section 1.3.1 of the Final EIS, the OCSLA and BOEM implementing regulations create a four-stage process for development of oil and gas resources in Federal waters. This four-stage oil and gas review process gives DOI and BOEM a continuing opportunity for making informed adjustments in developing OCS energy resources to verify all activities are conducted in an environmentally sound manner. Project-specific review and analysis of any exploration or development and production activities in the future will allow BOEM to fully consider any further changes to the climate and the affected environment prior to authorizing such activities.

BOEM would also continue to consult as necessary under the Endangered Species Act, Magnuson-Stevens Fishery Conservation and Management Act, National Historic Preservation Act, and any other applicable laws should lessees propose specific projects in the future. Such future consultation processes serve to offset the inherent lack of precision in predicting climate change-related impacts into the distant future.

Under the ESA, reinitiation of consultation typically occurs prior to commencing a new phase of a long-term project (e.g., development of an oil field after exploratory drilling); when substantial changes are proposed for project activities (e.g., proposed changes in location, frequency, timing and/or duration of a previously authorized activity or proposal of a novel activity); when a species in the project area receives Federal protection; when a previously undocumented federally-protected species or important habitat is identified in the project area. Reinitiation results in reassessment of impacts, and would take into account new scientific information, such as climatically-induced changes in species distribution. The process also allows management agencies to retract previous authorizations if the new analysis indicated that the proposed activities would jeopardize a listed species.

Lessees would also be responsible for obtaining various permits and authorizations that would precipitate further Federal review of climate change-related impacts. For instance, prior to engaging in activities that would "take" and marine mammals, lessees must first receive an incidental take authorization from NMFS and/or USFWS pursuant to the MMPA. NMFS and/or USFWS would take into account the current health of the marine mammal population(s) at issue, along with any climate change-related impacts, prior to determining whether to grant such authorization.

Issue 9. Air Quality

Summary of Comments

One commenter suggested that BOEM failed to take a hard look at the impacts of air and water pollution, stating NEPA clearly obligates the Bureaus to look at all environmental impacts, and an agency cannot excuse itself from its NEPA hard look duty because a "facility operates pursuant to a . . . permit. . ." or because the impacts have been discussed in a non-NEPA document. The commenter goes on to assert that BOEM's alleged failure to take a hard look at the air and water quality impacts on this basis clearly violates NEPA.

Several comments provided literature updates and policy changes that have occurred since the Draft EIS was written.

Source of Comments

- State Government

- Environmental Non-Governmental Organizations

Response to Comments

Air Emissions and Public Health. BOEM's air quality analysis appropriately assumes that any oil and gas activities stemming from Lease Sale 244 will adhere to EPA permitting requirements and therefore comply with the NAAQS. BOEM's analysis adds projected emissions to background emissions and finds that the NAAQS will not be exceeded. At the lease sale stage, there is no proposed plan against which to evaluate specific emission sources. In addition, such emissions would vary year-to-year and plan-to-plan. Therefore, it is appropriate to use a conservative approach in the analysis of activities. The NAAQS themselves are a public health standard. The Clean Air Act identifies two types of national ambient air quality standards "Primary standards provide public health protection, including protecting the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings." The EPA sets these standards of the criteria air pollutants and periodically reviews and revises them as necessary (EPA, 2016c). Any project or plans for exploratory drilling, geophysical, and geological surveys to full development and production that BOEM receives as a result of the Lease Sale 244 will be independently analyzed to ensure adherence to the EPA permitting requirements and therefore comply with the NAAQS.

Alaska AAQS. BOEM has made text changes to Section 3.1.4.1 to update the Final EIS with the latest adopted air quality standards, and appropriate references have been updated.

Alaska Offshore Jurisdiction. The State of Alaska has jurisdiction of the Air Quality over territorial waters (3nm from shore). Outside those waters EPA has jurisdiction but must comply with both State and Federal Air quality standards. Regardless of jurisdiction, BOEM takes a hard look at the direct, indirect, and cumulative impacts of the Proposed Action in Sections 4.3.1 and 5.2.1, as required by NEPA.

Public Participation. Commenters noted their concern regarding methane (CH_4) emissions, which BOEM analyzes in both its upstream and downstream air quality analyses, as well as in its water quality analysis. Potential methane emissions resulting from the Proposed Action are provided in Table 4.3.2-1, "Projected Average Annual Rate of Air Emissions." It is expected that any production project in the Cook Inlet will include the production of oil and natural gas. In this process, the only likely source of methane emission would be from leaks in the natural gas production pipelines. Pipelines under oil and gas operations go through rigorous approval and inspection operations from several State and Federal regulators to reduce any chance of oil or gas leaks.

Issue 10. Water Quality

Summary of Comments

BOEM received several comments regarding water quality. Some comments noted text changes were necessary to clarify or correct information regarding NPDES permits, State jurisdiction, vessel general permits, and specific statements describing the existing water quality in Cook Inlet.

Given the Draft EIS's frequent mentions that contaminants are swept out of Cook Inlet, one commenter recommended that BOEM revisit the assumptions others used to calculate Cook Inlet's rate of flushing, and then explain the method used and to recalculate the rate with newer data. The same commenter pointed out that the Integrated Cook Inlet Environmental Monitoring and Assessment Program (ICIEMAP) was a collaboration between industry, EPA, NOAA, and CIRCAC, and would be useful for characterizing the water quality in Cook Inlet.

Some comments indicated a preference for the prohibition of discharges either under the existing or future permits. A couple of comments suggested that the lease sale should identify the prohibition of these discharges as a condition of the lease sale. One commenter raised considerations specifically to Naturally Occurring Radioactive Material (NORM) that occurs in produced waters and the contamination of drinking water. One comment asserted that BOEM largely ignores the impacts to water quality that can result from water discharges, including deck drainage, human waste, bilge water contaminated with oil, and produced water from exploratory drilling activities, which can contain arsenic, lead and radioactive materials. Some comments opposed conducting Lease Sale 244, voicing concern over potential water quality degradation due to oil spills or other causes. Conversely, one commenter stated that studies conducted over the last 50 years have found no evidence of adverse environmental impacts from oil and gas development.

Source of Comments

- General Public
- Federal Government
- Environmental Non-Governmental Organizations
- Citizen Advisory Councils

Response to Comments

Requests for clarification or citations. Where appropriate, BOEM made suggested word changes or corrections, and made edits in response to requests for clarification, questions regarding citations, and similar issues.

Water quality degradation. Section 4.3.2 addressed the impacts of the Proposed Action on water quality. Section 3.1.5 describes lack of impacts by the Cook Inlet's past and present oil and gas production. The ICIEMAP study indicates there was no evidence for enhancement of any metal concentrations in bottom sediments or in suspended sediments linked to discharges of produced water from functioning oil and gas production facilities. Saturated hydrocarbons concentrations were found to be generally low, have to come from a variety of sources including biogenic inputs from terrestrial and marine sources, coal deposits, and with some small localized anthropogenic inputs. There is no evidence of hydrocarbon accumulations from the "large-volume" produced water discharges from any of the oil and gas production operations in central Cook Inlet, or from recent crude oil or distillate product releases in any of the sediment samples from this program.

Calculation for the rate of flushing in Cook Inlet. The cited source references (Kinney, Button and Schell, 1969; Kinney et al.,1970) clearly describe their salt balance and flushing time calculations. These calculations assume steady state. This is a valid assumption, particularly because the strong tidal turbulence in Cook Inlet is a major factor controlling the transport of salt up Cook Inlet and therefore the flushing time, and is independent of season. Furthermore, a review of the calculations in light of newly available data (Danielson et al., 2016), which includes more refined freshwater data, indicates that the flushing-time estimates quoted are conservatively high.

Updated Data. During the Public Comment period of the Draft EIS, BOEM received a study from participants in a collaborative Cook Inlet water quality program. ICIEMAP provided additional information through the report from Kinnetics Laboratories (2010), resulting in additions to the water quality text.

Since receiving the comment, BOEM obtained a final report that resulted from the data: Produced Water Discharge Fate and Transport In Cook Inlet, 2008-2009. The report was for NPDES Permit No. AKG-31-5000 (Kinnetic Laboratories, 2010) and provides a description of hydrocarbon constituents missing from the Draft EIS. BOEM reviewed and incorporated information from the report, updating the description of the affected area. BOEM has revised Section 3.1.5.2 to address the information.

BOEM found the information presented by Saupe, Gendron and Dasher (2005) to be useful for describing the water quality of Cook Inlet, and added it to the text in Section 3.1.5.2.

Drilling discharges and existing water quality. The exploration and development scenario for this EIS assumes that cuttings and drilling fluids from the 7-10 exploration wells will be disposed of at the drilling sites, and cuttings and fluids from development wells will be reused, reinjected, or shipped to shore for disposal. A DPP would evaluate each proposed project restrict disposal of drilling fluids and cutting from being discharged into Cook Inlet.

The NPDES discharge permit specifies various discharges which would be prohibited or limited in accordance with CWA authority and would be determined by the EPA during a development and production plan NEPA review and ODCE review. No substantive change was made to the text.

Comments from members of the general public expressed the opinion that existing discharges from oil and gas drilling were adversely affecting the water quality of Cook Inlet. Various studies in Cook Inlet have been accomplished and determined the water quality is good; and permitted NPDES discharges from existing gas and oil facilities have concentrations of metals and various hydrocarbons that are less than applicable water quality criteria, therefore the permitted concentrations of metals and hydrocarbons are not considered contaminants.

Commenters suggested that BOEM should consider potential impacts of drilling discharges to coastal and estuarine habitats. As discussed in Section 4.3.4.2, once discharged, particles of cuttings settle quickly to the seafloor near the discharge point (Neff, 2010; Neff, McKelvie, and Ayers, 2000). Any exploratory drilling that would allow drilling discharge would occur no closer than 3 mi from the coast and adjacent intertidal/subtidal areas.

Comments requested BOEM explain the context of the data gathered regarding nitrogen and phosphorous and explanation of the ratio between the two elements. By demonstrating the nutrients are below the threshold values, BOEM has illustrated the water quality was found to be good. Given the demonstrated conclusion, it is not relevant to the decision-maker or public to further analyze the data; additionally, a contextual explanation does not meet the NEPA directive for brief focused documents nor the rule of reason. BOEM revised Section 3.1.5.2 regarding the meaning of the ratio.

A review of the supporting literature as well as a more recent report by Kinnetic Laboratories (2010) agrees that elevated amounts of mercury (Hg) has not been identified in Upper Cook Inlet. BOEM revised Section 3.1.5.2 regarding the meaning of the ratio.

Concern over radiation release during drilling contaminating drinking water. Waste discharges are measured for radiation. Radiation produced from the depth of wells, and the geological formation containing oil and gas in Cook Inlet do not have radiation beyond normally occurring radioactive material occurring in the region.

Issue 11. Acoustic Environment

Summary of Comments

BOEM received several comments which suggested there is a lack of measurement for acoustic impacts of oil and gas activities in Cook Inlet shown in the Draft EIS, and called on BOEM to provide a more complete and comprehensive analysis of the effects of active sound sources on the acoustic environment. One comment raised concern related to impacts from seismic surveys; another voiced concern related to a lack of analyses on the aggregated effects of oil and gas activities. One comment asked BOEM to produce more complete and thorough analyses on the effects of active sound sources on the acoustic environment and marine mammals.

Source of Comments

- Environmental Non-Governmental Organizations

Response to Comments

BOEM has played a key role in improving the scientific understanding of noise and marine life to date (see http://www.boem.gov/Fact-Sheet-on-Sound-Studies/) and remains steadfastly committed to funding and supporting science needed to better understand anthropogenic sounds and their impacts on marine life. BOEM also is dedicated to using adaptive management for this complicated issue so that approaches evolve as understanding expands and the science matures. The Final EIS describes the pathways through which impacts from noise to marine mammals could occur and provides an analysis of these impacts in Sections 4.2.5, 4.3.6.3, 4.3.6.7, and each species under Section 4.3.6.9, Noise.

BOEM performed effects analyses using the existing body of scientific information. CEQ requires NEPA analyses to be concise, direct, and non-encyclopedic. The Final EIS concisely summarizes the acoustic environment and adequately informs the effects analysis. The aggregated effects of oil and gas activities are included in the Chapter 5 cumulative effects analyses. As to analyzing the collective acoustic effects of the Proposed Action, they are considered within the context of the level of activities described in the E&D Scenario and cumulative impacts scenario. For instance, seismic surveys must maintain a large distance between operating airgun arrays, otherwise the data collected would be compromised and useless. Consequently, only a limited number of airguns would be operating on lease at any given time. Likewise, the limited number of drilling rigs in Cook Inlet (fluctuating between 1 and 2) would limit the potential noise aggregations.

The analyses involving acoustics reflect the methodology used by the USFWS and NMFS in their work relating to Cook Inlet acoustics, and it is that methodology that determines takes, and level A and B harassment from anthropogenic noise sources. This analysis incorporates sound source verification studies conducted in Cook Inlet.

Issue 12. Lower Trophic Level Organisms

Summary of Comments

Several comments addressed lower trophic level organisms. Some commenters requested additional explanation regarding the affected environment, including distribution, movement trends, and trophic linkages for invertebrates. One comment noted an incorrect classification for *Fucus sp*. Other comments included:

- The Draft EIS does not address regime shifts in Cook Inlet.
- BOEM should analyze the potential impacts from aquatic invasive species.
- The Draft EIS often lacks detailed analysis of the scope or ripple effect that may occur in the food web or interaction web and its ecological consequences.

Source of Comments

- General Public
- Environmental Non-Governmental Organizations
- Citizen Advisory Councils

Response to Comments

BOEM corrected Section 3.2.1.2 regarding incorrect classifications, such as *Fucus* listed as green algae. BOEM inserted in Section 3.2.1 additional introductory information about regime shifts and food web connectivity. In response to comments, additional information about invertebrates was added where appropriate. Descriptions of marine communities and their ecological importance were already included in the Final EIS to provide context for analysis of impacts under NEPA. BOEM considers these descriptions adequate to support its impact assessment and inform the public and decision maker about potential impacts.

Issue 13. Fish and Shellfish

Summary of Comments

Several comments expressed concerns about the impacts of oil spills on fish and shellfish species. Many comments expressed concerns about the impacts of noise on fish. Some of these comments focused specifically on migrating salmon. A couple of comments voiced a lack of support for drilling in salmon migration paths. Many comments requested additional explanation regarding the affected environment, including species distributions and population trends for fish and shellfish. One comment pointed out that the Draft EIS does not consider ocean acidification impacts on fisheries. One comment challenged the use of biological data when sampling methodologies may be poorly known or not suited for comparison with other datasets. Another comment stated the EIS fails to adequately address the long term effects of seismic testing, pipelines, platforms, and tankers - and the spills and other pollution that accompany them - on local marine resources. One comment stated the Draft EIS often lacked detailed analysis of the scope or ripple effect that may occur in the food web or interaction web and its ecological consequences.

Source of Comments

- General Public
- State Government
- Citizen Advisory Councils
- Fishing Organizations
- Environmental Non-Governmental Organizations

Response to Comments

BOEM has revised portions of Sections 3.2.2.1 through 3.2.2.3 to clarify or describe in more detail the affected environment. BOEM revised Section 5.2.5.4 regarding the impact on climate change, including ocean acidification as well as food webs. Other issues, such as noise or oil exposure impacts, were already analyzed and discussed in adequate detail in the Final EIS in Sections 4.3.5.5 and 4.3.5.8, respectively. BOEM reviewed the best available science and relevant information to describe the affected environment and assess potential impacts from the Proposed Action, and stands by this process when determining whether a study draws reasonable conclusions from the methodologies described.

Issue 14. Marine Mammals

Summary of Comments

Several comments address the analysis of potential impacts to marine mammals. General comments include:

- Effects analyses were too brief, incomplete, inaccurate, did not use some methodologies, or did not use current information.
- The EIS failed to adequately address long-term cumulative effects.
- Critical Habitat issues for sea otters and beluga whales were not addressed.

- The NMFS Draft Recovery Plan for Cook Inlet Beluga Whales should have been considered.
- Mitigations for Cook Inlet beluga whales are insufficient to protect the species from the Proposed Action.
- There is insufficient information to assess the effects of noise on marine mammals in Cook Inlet.

Many comments related to impacts on marine mammals claimed the analyses were insufficient to adequately address the effects of the Proposed Action on marine mammals, or the Draft EIS failed to analyze the long-term effects to the Cook Inlet ecosystem. Other comments suggested combining the mitigation measures described in Alternatives 3A, 3B, and 3C to protect beluga whales and their habitat, or developing additional protective mitigation measures for this species.

Most comments were concerned with the thoroughness of effects analyses on ESA-listed cetaceans in Cook Inlet. Some comments found the Draft EIS ignores impacts to Cook Inlet beluga whales by minimizing impact assessments, failing the NEPA "hard look" standard. Other comments found the Draft EIS findings regarding oil spill effects on beluga whales to be inaccurate. Another comment suggested BOEM develop additional precautionary and response procedures for oil spills, in consultation with other Federal, State, municipal, tribal and public-at-large stakeholders, to ensure coordinated efforts into the future. Several comments expressed concern regarding the displacement of fish over areas in Cook Inlet that could adversely affect beluga whales. A few felt the effects of noise, oil spills, and potential vessel strikes on North Pacific right whales outside the action area but caused by Lease Sale 244 related increased vessel traffic were not sufficiently addressed.

Many comments discussed concern over a lack of information regarding the effects of acoustic disturbances on marine mammals in Cook Inlet, and found the existing body of knowledge is insufficient to permit informed and reasoned decision-making. Some felt the Draft EIS did not sufficiently analyze cumulative effects of sound from all noise sources in Cook Inlet on marine mammals, while recommending BOEM use techniques and tools derived since May 2016 to assess the cumulative effects of sound on marine mammals. Some comments found the Draft EIS ignored the behavioral and physiological effects of long-term, low-level noise, and the chronic effects of noise on marine mammals. Other comments noted the rationale for effects analyses amounted to a Catch-22, in that animals would avoid noise-disturbed areas; but animals approaching noisy disturbed areas would not be adversely affected.

Source of Comments

- General Public
- Federal Government
- Citizen Advisory Councils
- Environmental Non-Governmental Organizations

Response to Comments

Length and thoroughness of analyses. CEQ requires NEPA analyses to be concise, direct, and non-encyclopedic. They are to be concise, accurate descriptions of consequences for a Federal action, contain relevant information that directly addresses the topic, and should avoid redundancy and additional information that does not add to the discussion in a meaningful way. The resources of concern and of significance were identified during the scoping process, and BOEM performed effects analyses of these using the existing body of scientific information. The analyses in the document, though sometimes brief, are accurate and meet the above-described standards for NEPA. The effects analyses in this document are consistent with and reflect the methodologies used by the USFWS, NMFS, and other government entities in their analysis of work relating to Cook Inlet to determine take, level A and B harassment from anthropogenic noise sources, and effects of other anthropogenic activities on marine mammals. Additional information would not contribute to the existing analyses nor would it change the impact conclusions.

BOEM's noise impacts assessments accounts for the potential for injury (Level A Harassment), and behavioral disturbances (Level B Harassment) as those terms are defined under the MMPA. BOEM also considers any other pertinent information related to harassment and injury provided by the NMFS and USFWS, the agencies congressionally mandated to manage marine mammal populations. The analyses comply with legal requirements and what has typically been required by the NMFS or USFWS as mitigations in their permitting processes. Furthermore, the analyses were written with general disturbance information in the beginning, before going into more detailed, species-specific, analyses. This approach reduced redundancy in the analyses. The existing analyses are supported by existing scientific literature and remain accurate.

Most animals, marine mammals especially, refrain from engaging in an activity that results in increasing levels of discomfort or pain. Based on this assumption, no marine mammal swimming towards a noise source should experiencing excessive discomfort or pain, since they would relocate to quieter areas. Consequently, there is no Catch-22, in that a marine mammal bothered by noise would leave the area; however, if the noise does not produce discomfort, the creature may choose to remain in the area. This is why beluga whales sometimes approach to within a few meters of production platforms operating in Cook Inlet.

In addition to noise disturbances, Sections 4.3.6.1 and 4.3.6.2 describe the topics of seafloor disturbance, habitat alterations, and drilling discharges respectively. The descriptions are concise, yet accurate while complying with CEQ regulations, and such discussions provide the necessary information to produce informed decisions.

Any activities permitted by BOEM must comply with existing laws and regulations pertaining to discharges. Both the EPA and the U.S. Coast Guard oversee the implementation and enforcement of those regulations, as described in Sections 4.2.2, 4.2.3, and the fate of drilling discharges and cuttings in Section 4.2.11. Section 4.5.2 analyzes the overall effects of the alternatives on water quality, and found only minor effects to water quality would occur.

Lastly, the effects of discharges on marine mammals is an issue regularly addressed in the numerous IHAs/LOAs and ITSs issued by the USFWS and NMFS. http://www.nmfs.noaa.gov/pr/permits/incidental/energy/cook_inlet_ihas_draft_batched_ea_2016.pdf (Section 4.1.1, pages 35 and 36. More specifically in Section 4.1.1, on page 36 it states:

"No hazardous wastes should be generated as a result of this project. However, if any hazardous wastes were generated, they would be temporarily stored in an onboard satellite accumulation area and then transported offsite for disposal at an approved facility," and "Because of the limited discharges no water quality impacts are anticipated that would negatively affect habitat for Cook Inlet marine mammals."

Only impacts pertaining to marine mammals were analyzed in the marine mammals discussion; however, widespread ecological effects were segregated into the terrestrial and marine environments, terrestrial mammals, birds, marine mammals, fishes, invertebrates, etc. By compartmentalizing the food web and the ecosystem into its different elements the ecological consequences were analyzed.

With respect to beluga whales in Cook Inlet, the effects analyses in the Final EIS are consistent with what has been determined by NMFS in previous ESA/MMPA authorizations concerning Cook Inlet beluga whales, as well as what is found in the existing body of peer-reviewed scientific literature.

The Final EIS's characterization of potential spill effects on belugas is consistent with the findings of NMFS in their existing ESA/MMPA permits to oil and gas operators in Cook Inlet over the last 10 years. No new data have been provided or identified that would meaningfully alter or change the existing analyses.

Likewise, the effects of the Proposed Action on North Pacific right whales were analyzed. The chances of large and very large spills contacting or occurring and contacting right whale habitat were analyzed in the OSRA model (in Sections 4.3.6.8, OSRA, Cetaceans, North Pacific Right Whale and 4.12.6.6), and the effects and consequences of a large oil spill were addressed in Section 4.3.6.9, Cetaceans, North Pacific Right Whale. In the species-specific effects analyses for the North Pacific right whale it was stated the species is considered extralimital to the proposed Lease Sale Area, and that only large spills could potentially affect them in their critical habitat area, which lies south of Kodiak Island. Noises associated with any of the alternatives have virtually no chance of affecting the North Pacific Right Whale, nor do small spills. BOEM considered whether vessel traffic associated with the Proposed Action could impact North Pacific right whales, but determined that such impacts are not reasonably foreseeable. The chances of a vessel associated with the Proposed Action striking a North Pacific right whale are prohibitively small.

The effects analyses are consistent with permits issued by NMFS and the USFWS to oil and gas industry in Cook Inlet, in the form of IHAs, LOAs, and ITSs in previous years. Such activities regularly occurred in state waters such as with the Cosmopolitan Unit, which is adjacent to the Proposed Lease Area.

Some respondents expressed concern that the displacement of fish and other prey species in Cook Inlet could adversely affect beluga whales and other marine mammals. This topic was adequately covered in Section 4.3.6.9, Cetaceans, Cook Inlet Beluga Whale, Seafloor Disturbance and Habitat Alteration. Furthermore, the reactions of beluga whale prey species to the Proposed Action were also fully described in Section 4.3.5, Fish and Shellfish.

Critical Habitat and Recovery. These topics are discussed in Chapters 3, 4, and 5 of this EIS. Alternatives 3A, 3B, 3C, 4A, and 4B were also created with critical habitat protection in mind. The USFWS designates critical habitat for sea otters, and the NMFS designates critical habitat for cetaceans, seals, and sea lions. Critical habitat designations from the USFWS and NMFS are depicted in Figures 3.2.3-1, 3.2.3-4, 3.2.3-7, and 3.2.3-9. Critical Habitat for beluga whales, North Pacific right whales, the WDPS of Steller sea lions, and for the Southwest Alaska DPS of sea otters is discussed in Section 3.2.3.1.

The Proposed Action excludes North Pacific right whale and Steller sea lion Critical Habitat, and mostly excludes beluga whale and sea otter Critical Habitat to minimize the effects on those species. Alternatives 3A, 3B, 3C, 4A, and 4B further limit what, if any, impacts could occur to Critical Habitat for beluga whales and sea otters in Cook Inlet, Alaska.

A fact sheet describing sea otter Critical Habitat for the Southwest Alaska Distinct Population Segment of Northern Sea Otters is at: https://www.fws.gov/alaska/fisheries/mmm/seaotters/pdf/SeaOtterCHFactSheet16DEC2008.pdf.

Likewise the recovery plan for the Southwest Alaska Distinct Population Segment of Northern Sea Otters is at: https://www.fws.gov/alaska/fisheries/mmm/seaotters/pdf/Recovery%20Plan%20SW%20AK%20DPS%20Sea%20Otter%20Aug13.pdf, and the 5-Year Review for the Southwest Alaska DPS of the Northern Sea Otter can be accessed at: https://www.fws.gov/alaska/fisheries/mmm/seaotters/pdf/SW%205_year_review_sept_2013.pdf.

Collectively, the existing critical habitat and the recovery plan show the Southwest Alaska DPS of Northern Sea Otters should not only be protected, but should recover using the existing set of protections developed by the USFWS, including their mitigations for oil and gas activities in Cook

Inlet. Similarly BOEM considered the NMFS Draft Recovery Plan for Cook Inlet Beluga Whales. It is located in Chapter 7, Literature cited, as:

NMFS. 2015a. Draft Recovery Plan for the Cook Inlet Beluga Whale (*Delphinapterus leucas*). Alaska Regional Office, Protected Species Division, Juneau, AK. https://alaskafisheries.noaa.gov/protectedresources/whales/beluga/recovery/draftcibrecoveryplan051515.pdf, and is citied multiple times throughout the marine mammals sections of the Final EIS.

Other potential effects to critical habitat for marine mammals were addressed in the effects analyses for the respective species. Due to geography, only large to very large oil spills have the potential to affect Critical Habitat for the WDPS of Steller sea lions or North Pacific right whales.

The Critical Habitat avoidance measures built into Alternatives 3A, 3B, 3C, 4A, and 4B provide varying methodologies to avoid impacting Critical Habitat. Moreover operational mitigations to avoid impacting marine mammals were incorporated into the effects analyses in Chapter 4. The agency preferred alternative integrates some of the avoidance methodologies from various alternatives (see Chapter 2, Section 2.2.7).

NMFS and the USFWS require mitigations in their permits to the oil and gas industry to prevent harm to marine mammals, especially ESA-listed marine mammals. Due to the consistency between the mitigations provided by BOEM and the mitigations required by NMFS and the USFWS in recent years, particularly with respect to ESA-listed species, the effects of the Proposed Action should be greatly reduced, and no marine mammals should be harmed whether they are in Critical Habitat or not, nor should any Critical Habitat be harmed or compromised. At the site-specific stage, NMFS may identify additional mitigation measures to protect beluga whales as part of a Biological Opinion developed through Section 7 consultation with BOEM pursuant to the ESA. NMFS may also incorporate additional mitigation measures into any incidental take authorizations (i.e. Letters of Authorization (LOAs) or an Incidental Harassment Authorizations (IHA)) issued pursuant to the MMPA and its implementing regulations.

Cumulative impacts. The immediate and long-term cumulative effects of the Proposed Action, including long-term effects of seismic testing, pipelines, platforms, tankers, and different forms of pollution on marine mammals, are analyzed in Section 5.2.6 of this EIS. The long-term effects of oil spills, relative to what is reasonably foreseeable with the Proposed Action, were addressed in OSRA analyses (Sections 4.3.6.8, OSRA), and the effects and the consequences of a large oil spills were addressed Section 4.3.6.9. At least one comment suggested BOEM develop additional precautionary and response procedures for oil spills, in consultation with other Federal, State, municipal, Tribal and public-at-large stakeholders, to ensure coordinated efforts into the future.

As per applicable law, the adequacy precautionary and response procedures for oil spills are analyzed by BSEE on a plan-specific basis when the location, timing, and nature of activities becomes known, and when an oil spill response plan is proposed. BOEM did not identify any additional measures beyond those already required by applicable regulations that warranted analysis at the lease sale stage.

Another concern amongst respondents was the analyses of noise effects on marine mammals within Cook Inlet. Such analyses were made in Section 5.2.6. There are several oil and gas fields that have been in production in Cook Inlet since the 1960s and 70s. A summary of the other activities in Cook Inlet that could affect marine mammals is in Table 5.2.6-1, and the cumulative effects analyses were made in Section 5.2.6 5. The behavioral and physiological effects of noise on marine mammals were described in Sections 4.3.6.3, 4.3.6.7, 4.3.6.9, and 5.2.6.

Adequacy of information. BOEM has invested a great deal of resources into scientific investigations relating to fisheries, oceanography, and marine mammal biology/ecology in Cook Inlet over the years. Some of these reports and publications can be accessed at BOEM's ESPIS website (http://www.boem.gov/ESPIS/), while others were funded but conducted by NMFS, the USFWS, the

USGS, ADF&G, the University of Alaska, and others. BOEM has also published multiple NEPA analyses considering the effects of oil and gas activities on Cook Inlet environmental resources, including marine mammals.

In preparing the effects analysis section for marine mammals in Cook Inlet, BOEM also considered the effects of noise on the same or similar species in other locations to approximate effects. The analysis also incorporates the results recent marine mammal monitoring programs that occurred in Cook Inlet as directed by the NMFS and USFWS. These monitoring programs document behavioral responses of marine mammals to acoustic disturbances in Cook Inlet, and collectively yield some of the most accurate data available. In total, BOEM determined that there was sufficient information available to inform the effects analysis and facilitate a reasoned choice between lease sale alternatives.

Other Federal agencies have also found the existing level of information to be sufficient to support their environmental analyses and regulatory determinations. There was sufficient information for the NMFS to issue Take Authorizations under the MMPA for marine mammal species under their jurisdiction found in Cook Inlet. (http://www.nmfs.noaa.gov/pr/permits/incidental/oilgas.htm), and Biological Opinions, also available on NOAA's website. The USFWS has also issued Biological Opinions and permits for activities within Cook Inlet (http://www.boem.gov/uploadedFiles/BOEM/About_BOEM/BOEM_Regions/Alaska_Region/Environment/Environmental_Analysis/BOCISale149.pdf). The existing body of scientific information at the time NMFS and the USFWS authored their permits, some as recently as 2015, was deemed sufficient to perform their effects analyses, before issuing the IHAs, ITSs, BOs, etc. The Final EIS in turn incorporates relevant information from those recent NMFS and USFWS analyses, and is consistent with those analyses.

NMFS Technical Guidance. Subsequent to publication of the Draft EIS, NOAA Fisheries published a Technical Memorandum entitled "Technical Guidance for Assessing Effects of Anthropogenic Sound on Marine Mammal Hearing – Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts" (Technical Guidance). The Technical Guidance provides "updated received levels, or acoustic thresholds, above which individual marine mammals under NMFS' jurisdiction are predicted to experience changes in their hearing sensitivity (either temporary or permanent) for all underwater anthropogenic sound sources" (81 *FR* 51693). NOAA Fisheries further explains that these thresholds update those currently in use by NMFS. Updates include a protocol for deriving PTS and TTS onset levels for impulsive (e.g. airguns, impact pile drivers) and non-impulsive (e.g., tactical sonar, vibratory pile drivers) sound sources and the formation of marine mammal hearing groups (low- (LF), mid- (MF), and high-frequency (HF) cetaceans and otarid (OW) and phocid (PW pinnipeds in water) and associated auditory weighting functions. Acoustic thresholds are presented using the dual metrics of cumulative sound exposure level (SELcum) and peak sound pressure level (PK) for impulsive sounds and the SELcum metric for non-impulsive sounds.

It should be clarified that NMFS has not updated its Level A and Level B acoustic harassment criteria under the MMPA and ESA at this time. When assessing impacts under the MMPA and ESA, NMFS will continue to consider not only the most current acoustic thresholds, but also other factors such as behavioral impacts thresholds, auditory masking assessments, evaluations to help understand the ultimate effects of any particular type of impacts on an individual's fitness, population assessments, etc.

BOEM has incorporated this new Technical Guidance into the Final EIS because it enhances understanding of potential noise-related impacts to marine mammals in Cook Inlet. Specifically, the Final EIS includes updated information concerning species-specific hearing ranges and thresholds for onset of PTS and TTS. The analysis of potential impacts to marine mammals in Chapters 4 and 5 is based on BOEM's consideration of this new information.

BOEM defers to NMFS's recommended Technical Guidance over recommendations made in comments concerning the application of behavioral thresholds.

Effects from chronic noise or from multiple activities. As is explained in Section 4.3.6, most of the oil and gas activities considered here – i.e. drilling, vessel traffic, aircraft traffic –produce limited degrees of noise that will attenuate to background noise levels relatively close to the source. The only oil and gas activities truly likely to impact marine mammals via noise are marine seismic surveys. These are temporary activities that would occur only intermittently over the course of the E&D Scenario. Any impacts from such activities on marine mammals would likewise be of a temporary nature, with affected animals returning to baseline conditions shortly thereafter. Overall, the frequency and severity of noise exposures anticipated to result from the E&D Scenario is not sufficient to cause any chronic effects or permanent harm to marine mammals. This holds true not only for the individual activities comprising the E&D Scenario, but also for these activities collectively; there is no reason to expect that minor disturbances experienced across broad spectrums of time and space would somehow combine to cause serious impacts to marine mammals.

Concerns about reflection and/or reverberation of sound are noted but are not expected to influence the effects analysis. Noise is expected to attenuate rapidly in the shallow waters of Cook Inlet. Basin-wide increases in background noise from reflection and/or reverberation are not established in current literature, and are not expected to occur based on best professional judgment.

It is also reiterated that each exploration and development and production activity requires review and approval by BOEM before its conduct. BOEM's environmental reviews at these later stages of the OCSLA process will entail more specific consideration of the nature, timing, and location of proposed activities, along with the status of any marine mammals likely to be affected by those activities. Mitigation measures required by NMFS and/or USFWS as part of MMPA incidental take authorizations or ESA consultation will further that any impacts to marine mammals do not approach the levels suggested in certain public comments.

Meanwhile, cumulative impacts to marine mammals in Cook Inlet are analyzed in detail in Section 5.2.6. BOEM has reviewed the tool for "modeling species' responses to aggregated exposure" suggested in a comment, but finds that it does not address sufficiently analogous circumstances to be of value in the Final EIS.

Issue 15. Birds

Summary of Comments

Several comments address potential impacts to marine and coastal birds. Some of these comments reference recent die-offs of birds, two specifically referring to common murres, and state that these die-offs are not something we really understand; that they are a big warning to us because birds reflect the health of the oceans. One comment raised concern that birds in the area are not nesting or laying eggs.

Two comments critiqued BOEM's analysis of impacts to Steller's eiders; one specifically stating the species will face threats from offshore drilling in both the Arctic region and the Cook Inlet region, "yet BOEM fails to account for how exposure to oil and gas activities across multiple planning areas could impact the species."

One comment discussed seabirds' vulnerability to disorientation from oil and gas operations that increase light pollution. This comment pointed out that "artificial light attracts seabirds at night, especially nocturnally active species such as auks, shearwaters, and storm-petrels, and disrupts their normal foraging and breeding activities in several ways." The comment discussed light entrapment, which can lead to exhaustion and mortality, stating "Seabirds also frequently collide with lights or structures around lights, causing injury or mortality, or on lighted platforms where they are vulnerable to injury, oiling or other feather contamination, and exhaustion."

Other comments included:

- Oil spills can impact birds and every effort should be made to develop additional precautionary and response procedures, in consultation with other Federal, State, municipal, tribal and public-at-large stakeholders, to ensure coordinated efforts into the future.
- The Draft EIS often lack detailed analysis of the scope or ripple effect that may occur in the food web or interaction web and its ecological consequences.
- The EIS fails to adequately address the long term effects of seismic testing, pipelines, platforms, and tankers - and the spills and other pollution that accompany them - on local marine resources.
- One comment stated that species lists in the Draft EIS are incomplete and asked that BOEM please list all species of birds occurring in the Cook Inlet Watershed (Estuary) and adjacent waters/lands that may be directly or indirectly impacted by the Proposed Action and associated activities.

Source of Comments

- General Public
- Environmental Non-Governmental Organizations
- Federal Government

Response to Comments

Recent seabird die-off and failures to nest. BOEM is aware of the substantial seabird die-off in 2015-16, perhaps the largest on record in the Gulf of Alaska (GoA), and of the 2016 colony failures in the GoA and Bering Sea (H. Renner, pers. comm., 2016), and agrees that these are important seabird issues. These phenomena, however, likely reflect very complex ecological phenomena, and since very recent, there is currently little available scientific information that describes them. Possible causal factors such as biotoxins for the die-off and subsequent lack of fitness or other preparedness for the breeding season are as yet unconfirmed. BOEM has revised the Final EIS to acknowledge the existence of these recent phenomena, and BOEM will continue to closely monitor these issues. BOEM revised Section 5.2.8.4, Cumulative Effects-Climate Change, as a "best fit," but BOEM acknowledges that there may be other or different causal agents besides climate change. As more detailed information about the GoA seabird die-off and colony failures becomes available, and if the OCS oil and gas activities progress to the Exploration and Development and Production stages, BOEM will consider those details and any other relevant new information available in those later NEPA analyses. In the meantime, given the large size of the GoA populations of the species affected, the relatively low level of vulnerability of these overall GoA populations to anticipated effects from the Proposed Action in Cook Inlet, along with other factors, it is not expected that these events will meaningfully influence the level of anticipated impacts from the Proposed Action, or vice versa.

Ripple effects to the food web or interaction web. This topic has been addressed in all relevant Bird sections, for example where considering the effects of drilling and oil spills on invertebrate and fish food resources of birds and how that could impact birds (Section 4.3.8).

Long-term effects of seismic testing, pipelines, platforms, and tankers. These topics are the primary sources of discussion for Birds in 4.3.8, except the effects of tankers, which are not part of the Lease Sale 244 scenario.

Vulnerability of seabirds and Steller's eider to light hazards. The commenter stated that BOEM did not adequately consider this vulnerability and gave examples of the potential impacts. BOEM recognizes that vulnerability to light attraction is an important consideration in the analysis of impacts to migratory birds, and in fact concluded that "the greatest potential direct impact to birds from routine operations is anticipated to be from mortality of birds colliding with….offshore platforms and vessels.." (Section 4.3.8.9). Prior to that conclusion, Section 4.3.8.3 contains almost three pages of detailed information on light hazard vulnerability and impacts, including the specific entrapment, exhaustion, and collision impacts cited by the commenter. Regarding Steller's eider, as noted in the Draft EIS, the USFWS estimates that only 0.8% of the molting and wintering Steller's eiders in Alaska waters are from the listed population (USFWS, 2015), which BOEM estimates translates to approximately tens of eiders in Cook Inlet. The vulnerability of all relevant eiders, listed and non-listed combined, to light hazards is acknowledged and discussed (see above), but the probability that one or more of less than 100 individuals present from the listed population will be vulnerable to light hazard impacts from the two platforms and associated vessels of the Proposed Action is, in effect, estimated to be negligible to minor. Concluding that minor impacts to such a small population of listed Steller's eiders in such a large area (i.e., Cook Inlet) could result from light hazards is appropriately conservative.

Exposure of Steller's eider to oil and gas activities across multiple planning areas (i.e. the Arctic and Cook Inlet). The commenter stated that such exposure has not been adequately considered. BOEM recognizes that the listed population of Steller's eider that occurs in Arctic OCS waters during the breeding and molt migration seasons does subsequently molt and winter, along with non-listed Russian-breeding members of the species, in southwest Alaskan waters (primarily north of the Alaskan Peninsula), and that some of these, probably less than 100 (i.e., tens), winter in Cook Inlet waters. Therefore, it is conceivable that some of the same individuals of the listed population of this migratory species could be subject to potential impacts from oil and gas activities in more than one OCS-Project Action Area. BOEM agrees that environmental review and consideration of potential impacts of oil and gas activities in all relevant habitats of these few individuals may be warranted at appropriate stages in the NEPA process. However, given the relatively low incidence of Steller's eiders in Beaufort Sea waters, where ACP oil and gas activities are currently concentrated, and even lower probability that these same Beaufort Sea individuals would also be exposed to potential impacts of the current Proposed Action, BOEM considers the current level of review appropriate. Furthermore, there are currently no active plans to conduct oil and gas activities on the Chukchi Sea Planning Area or the Beaufort Sea Planning Area, and all pending Chukchi Sea and Beaufort Sea lease sales in the Outer Continental Shelf Oil and Gas Leasing Five-Year Program for 2012-2017 were cancelled on October 16, 2015.

Comprehensive list of all species of birds occurring in the Cook Inlet watershed that may be directly or indirectly impacted. One commenter requested such a list be included, however, BOEM considers that the description of the five taxonomic groups of birds found in the Cook Inlet watershed (passerines, raptors, seabirds, waterfowl, and shorebirds), including reference to over 40 key species, in Section 3.2.5.1 is more than sufficient to inform the public and the decision-maker about potential impacts to birds. In other words, Section 3.2.5.1 presents broadly comprehensive, yet detailed information on all pertinent bird resources, and seeks to focus on all important relevant avian impacts and issues by avoiding a uselessly bulky volume of material that would not add appreciably to the understanding of the impacts.

Issue 16. Economic Impacts

Summary of Comments

Several comments raised the issue of potential economic impacts of Lease Sale 244. Two comments discussed the importance of oil and gas production in Cook Inlet to both the local and state economy, pointing out that new oil and gas production in the Cook Inlet would create many new jobs and increase local tax revenue. Two other comments discussed economic decline due to dropping oil prices, one pointing out that if Lease Sale 244 is cancelled, this decline will continue, and people will continue to leave the state. One comment asked “how can we allow the oil companies to drill and take our oil with no compensation to the state?” Finally, one comment noted the market should determine interest, and industry should determine if it is feasible to operate under current economic conditions.

Source of Comments

- General Public
- Local Government
- Industry Non-Governmental Organizations

Response to Comments

Positive economic impacts from leasing. Sections 4.2.13 and 4.3.10 of the Final EIS discuss potential positive economic impacts. If leases are purchased and subsequently explored and developed as predicted in the Exploration and Development Scenario, there may be as many as 427 direct and induced jobs created during the period of well drilling and infrastructure installation. During the production and decommissioning phases, an estimated 99 direct and induced jobs would be created. Indirect and induced earnings are estimated to peak at $35 million and remain at $9 million per year during production.

Compensation to the State. Exploration, development, and production would generate direct employment and direct earnings. In turn, the direct employment and earnings would generate indirect employment and earnings induced by the project (i.e., exploration, development, and production). Together, direct, indirect, and project-induced employment and earnings would influence potential growth in the local population and would determine the total fiscal effect to the Kenai Peninsula Borough (KPB), State of Alaska, and Federal Government (see Section 4.3.10). If leases are purchased and subsequently developed, there may be jobs created during the development (drilling and infrastructure installation) phase of activity. BOEM estimates that number will plateau at 99 jobs during the longer phase of production. Indirect and induced earnings are estimated to peak at $35 million and remain at $9 million per year during production. These additional earnings would generate revenue for the state of Alaska and the Kenai Peninsula Borough (see Section 4.2.13). Direct employment and earnings generate indirect and project-induced employment and earnings through the value of goods and services purchased by workers, and the retail and wholesale jobs created when the workers spend their money on other products in the economy (see Section 4.3.10.1). In addition to this indirect revenue, money could also flow directly into State of Alaska and the Kenai Peninsula Borough coffers. The state of Alaska will receive 27% of the bonus bids, rentals, and royalties collected from Federal leases located within 3 miles of the boundary line between state and Federal waters. The Borough will receive property tax revenues from pipelines or other structures built onshore. The predicted direct payments for the lifetime of the project are $27 million to the state of Alaska and $8 million to the Kenai Peninsula Borough (2015 dollars).

Industry interest in leasing. Proceeding with a Cook Inlet lease sale would allow industry to determine whether it has an interest in the areas offered for lease. If leasing does not take place (either through cancellation of the sale or if there are no bids), no exploration, development or production will occur. Impacts in a scenario where no leases are issued would then be the same as those identified in the No Action alternative.

Issue 17. Fishing

Summary of Comments

BOEM received comments concerning fishing that addressed the importance of fisheries in the proposed Lease Sale Area and stated that BOEM should more adequately address the long-term impacts to commercial, sport, personal use, and subsistence fishing. These comments expressed concern over the impact Lease Sale 244 could have on the people who depend on fishing for their livelihood. Many comments also expressed concern over potential damage to fisheries from oil spills. One comment stated that an oil spill could wipe out the remaining razor clam population in Cook Inlet. One comment asserted the proposed Alternative 5 inadequately protects the Gillnet fishery. The Draft EIS erroneously states commercial fishers would be able to use alternative fishing grounds during times of space-use conflict; however, there are no alternative fishing grounds due to existing boundaries and seasonal limitation set by the state of Alaska and other fisheries management agencies. Conversely, one commenter felt encouraged to see the Draft EIS addressed the Gillnet fishery and stressed the importance of ongoing communication and mitigation measures to avoid potential conflicts. One commenter said that BOEM did not address impacts of the Proposed Action to the humans living in the proposed Lease Sale Area who depend on fisheries resources.

Source of Comments

- General Public
- Local Government
- Fishing Organizations
- Environmental Non-Governmental Organizations

Response to Comments

BOEM has adequately addressed the effects of this Proposed Action to sport, personal use, and subsistence fishing. Please see Sections 4.3.12 and 4.3.16 for details about potential impacts and impact conclusions for these types of fishing activities in the proposed Lease Sale Area.

For subsistence fishing, BOEM anticipates minor impacts from routine activities and small spills associated with the Proposed Action. For a large spill, BOEM anticipates major effects to subsistence harvest of fish.

For sport fishing, BOEM anticipates minor impacts from routine activities and small spills and moderate effects from a large spill.

If a large spill contacted subtidal and intertidal habitats, there could be moderate impacts to fish and shellfish such as razor clams, resulting in lethal and sublethal effects on intertidal individuals. Local populations of nearshore shellfish could be measurably depressed for about a year, and small amounts of oil could persist in shoreline sediments for a decade or more. However, the spill would affect a small portion of the total habitat and likely would be limited to subpopulation-level effects and thus would most likely not eliminate entire populations of shellfish (see Sections 4.3.5 and 4.3.5.9).

BOEM has adequately addressed the effects of the Proposed Action to the people who live in the proposed Lease Sale Area. Please see Sections 4.3.10 through 4.3.16 and 4.3.20 for detailed descriptions of potential effects of the Proposed Action to humans and human systems in the proposed Lease Sale Area; each of these sections includes specific impact conclusions.

BOEM agrees that in many cases commercial fishers may not have alternative fishing grounds or times of year to adjust to potential disturbances to their operations from an oil spill or industrial activities in Cook Inlet. This is largely due to timing and area limitations set by fisheries managers and regulatory agencies and bodies that administer and regulate commercial fishing activities and the industry as a whole. BOEM agrees that commercial fishing is the primary source of income for many people and their families living in the proposed Lease Sale Area and elsewhere. Potential closures of entire commercial fishing seasons or parts of seasons due to the Proposed Action, including a large oil spill, could have major effects on these fishers and substantial economic losses to the industry and family incomes for commercial fishers.

BOEM has determined that the impact conclusions in Section 4.3.11.7 of the Draft EIS do not adequately correspond to the detailed description of potential impacts to commercial fishing presented in Section 4.3.11. BOEM has revised sections of the Final EIS accordingly.

Issue 18. Subsistence Harvest Patterns

Summary of Comments

Two comments discussed concerns about impacts to subsistence harvest patterns. One stressed that Lease Sale 244 would directly impact families in the planning area, due to their reliance on subsistence for survival. Another comment stated BOEM needs to consider the subsistence area of all Cook Inlet Tribes (including Seldovia Village Tribe), and BOEM should ensure utilization of current subsistence and scientific data when considering Lease Sale boundaries.

Source of Comments

- Environmental Non-Governmental Organizations
- Tribal Governments

Response to Comments

BOEM has evaluated potential effects of this lease sale on subsistence harvest practices by communities and Native villages in the proposed Lease Sale Area. Both Seldovia Village and Seldovia City are accounted for in the Final EIS's description of subsistence harvest patterns for the proposed Lease Sale Area. Please see Tables 3.3.3-1, 3.3.3-2, 3.3.3-3, and 3.3.3-5 and Figure 3.3.3-10. Seldovia is included in the oil-spill risk analysis for subsistence harvest patterns under Section 4.3.12.11. The Final EIS incorporates and analyzes subsistence literature and subsistence harvest data updated since the Lease Sale 191 environmental impact statement. Please see Figure 3.3.3-10, which shows composition of wild food consumption by residents of Seldovia and other communities in the KPB. The source of these data is Alaska Department of Fish and Game, Subsistence Division, Community Subsistence Information System, 2015; these data are updated by the State of Alaska as new harvest information becomes available. The EIS cites work by the Seldovia Village Tribe published in 2013 entitled, *Assessment of Cook Inlet Tribes Subsistence Consumption*. The EIS cites subsistence salmon and halibut data reports published in 2014 by the Alaska Department of Fish and Game, Subsistence Division.

Issue 19. Public and Community Health

Summary of Comments

Two comments pointed out the Draft EIS did not provide quantitative estimates of how air pollution could increase the incidences of respiratory and cardiovascular diseases, nor did it quantify increases in respiratory, endocrine, immunological, and genotoxic effects that could occur due to a large oil spill.

Commenters stated BOEM largely ignores the impacts to water quality, marine life, and public health and welfare that will result from such pollution—including failing to quantify the impacts on public health—because wastewater discharges and air emissions are regulated by the Clean Water Act and Clean Air Act, respectively. But NEPA clearly obligates the Bureaus to look at all environmental impacts, and an agency cannot excuse itself from its NEPA hard look duty because a "facility operates pursuant to a . . . permit. . .” or because the impacts have been discussed in a non-NEPA document. The Draft EIS notes that air pollution could increase the incidences of respiratory and cardiovascular diseases but does not provide quantitative estimates of those effects. It similarly observes that oil spills can cause respiratory, endocrine, immunological, and genotoxic effects but does not indicate how widespread those harms would be if a large oil spill happened.

Source of Comments

- General Public
- Environmental Non-Governmental Organizations

Response to Comments

The impacts scale applied in the Final EIS is described in Section 4.1.1. This scale applies a qualitative continuum from negligible to major levels of effect. The scale does not quantify levels of impacts. BOEM disagrees that it “*… largely ignores the impacts to water quality … and public health and welfare that will result from such pollution …*” Impacts of the Proposed Action to air quality are discussed in detail in Section 4.3.1. This section concluded that BOEM expects short-term and localized, and less than severe (and thus minor) effects to air quality from routine activities, small spills, and a large spill. Impacts of the Proposed Action to water quality are discussed in Section 4.3.2. This section concluded that BOEM expects short-term and localized, and less than severe (and thus minor) effects to air quality from routine activities and small spills; for a large spill, BOEM concludes impacts to water quality could be long lasting and widespread, and less than severe (and thus moderate).

Impacts of the Proposed Action to public and community health are discussed in Section 4.3.14. This section concluded that BOEM expects short-term and localized, and less than severe (and thus minor) effects to public and community health from routine activities and small spills; for a large spill, BOEM concludes impacts to public and community health could be long lasting and widespread, and less than severe (and thus moderate). If exploration and development and production plans are submitted in the future, BOEM will conduct air and water quality analyses and public and community health impacts analyses in future NEPA documents. For these future actions, BOEM, in conjunction with the State of Alaska and other partners, would most likely conduct a health impact assessment to quantify effects.

In the Final EIS, BOEM’s air quality analysis appropriately assumed that any oil and gas activities stemming from Lease Sale 244 will adhere to EPA permitting requirements and therefore comply with national air quality standards (i.e., the NAAQS). BOEM’s analysis added projected emissions to background emissions and found that the NAAQS will not be exceeded. At the lease sale phase, there is no proposed plan against which to evaluate specific emission sources. In addition, such emissions would vary year-to-year and plan-to-plan. Therefore, it is appropriate to use a conservative approach in the analysis of activities, which is the approach taken in this Final EIS.

To further clarify, the NAAQS themselves are a public health standard. The Clean Air Act identifies two types of national ambient air quality standards “Primary standards provide public health protection, including protecting the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings” (please see https://www.epa.gov/criteria-air-pollutants/naaqs-table). The EPA sets these standards of the criteria air pollutants and periodically reviews and revises them as necessary.

Any plan for exploratory drilling, geophysical and geological surveys, or full development and production that BOEM receives as a result of the Lease Sale 244 will be independently analyzed in NEPA processes to ensure adherence to the EPA permitting requirements and therefore comply with the NAAQS.

BOEM indicated in Section 4.3.14.3 how widespread moderate effects would be if a large spill occurred:

> Large oil spills can have long lasting and widespread and adverse but reversible impacts for community members living in the impact zone and spill response workers (i.e., resident and non-resident volunteers and paid professionals) engaged in cleanup efforts (Eykelbosh, 2014). There is some evidence of respiratory, endocrine, immunological, and genotoxic effects persisting for years in those more highly exposed to the spill and its resulting contaminants (Final EIS, Section 4.3.14.3).

Issue 20. Recreation, Tourism, or Visual Resources

Summary of Comments

Several commenters addressed impacts on recreation, tourism, or visual resources in the proposed Lease Sale Area. Most commenters expressed concerns that the Proposed Action would adversely affect recreation and tourism opportunities. Specifically, they stated unsightly platforms and allegedly high probabilities of oil/gas leaks into the nutrient-rich ocean would severely effect recreation, tourism, and visual resources.

One commenter said that customers who seek nature-based recreation and tourism opportunities would not find drilling rigs in Cook Inlet compatible with their outdoor experiences. They stated the Draft EIS was inadequate in considering the negative impact of drilling rigs and associated activities on the Alaskan visitors' experience.

A few comments expressed concerns that the Draft EIS did not adequately explain impact conclusions related to recreation, tourism, and visual resources, and suggested that BOEM expand on these topics. One of these comments pointed out that the EIS needs to be more specific and point out where areas of great recreational value are located and how the agency would guarantee these places would be protected. This comment expressed concern that the Draft EIS concludes that only onshore pipelines would detract from the overall viewer experience and apparently overlooked the effects of platforms.

Source of Comments

- General Public
- Environmental Non-Governmental Organizations

Response to Comments

In Section 3.3.6, BOEM described in detail the recreation and tourism opportunities and visual resources in the proposed Lease Sale Area. Sections 3.3.6 and 3.3.9 both describe in detail areas of special concern in the proposed Lease Sale Area. These include national parks and preserves, state parks and game refuges, national monuments, wildlife refuges, national forests, and other protected areas. These places are highly important and valued for recreation and tourism. These places have existing laws, regulations, and management plans that would protect these lands and visitor experiences and recreational opportunities from onshore industrial developments and infrastructure related to the Proposed Action.

In Table 3.3.6-2, BOEM showed 26 scenic places having visual resources in the proposed Lease Sale Area. This table includes distances in miles from the proposed Lease Sale Area. Twenty of these scenic places, used for recreation and tourism and having visually important resources, are more than four miles away from the proposed Lease Sale Area; some places are located up to 18 miles away from the proposed Lease Sale Area. The average distance away from the proposed Lease Sale Area portrayed in Table 3.3.6-2 for these special places is 9.7 miles. There are currently 17 platforms in state waters of Cook Inlet; the E&D scenario predicts that two or three additional platforms could be installed as a result of the proposed Lease Sale. At such distances, visitors to the area would most likely not see drilling platforms in the Cook Inlet. BOEM agrees that just knowing that these structures exist in the proposed Lease Sale Area could have an effect on the perceived experiences of some visitors who may be seeking a pristine wilderness experience. BOEM anticipates short term and localized and thus minor effects to visual and aesthetic resources from structures and lighting on the outer continental shelf, primarily at night, if such structures (e.g., drilling platforms) are developed as part of this proposed Lease Sale (see Section 4.3.15.8.).

BOEM addressed in detail potential effects to recreation, tourism, and visual resources in Section 4.3.15. In this section, BOEM concluded the effects of routine activities on recreation, tourism, and visual resources are expected to be short term and localized and thus minor. Small spills would result in little or no impact and thus have negligible effects on recreation and tourism. Small spills could have short term and localized impacts on visual resources. An accidental large oil spill could cause long lasting and widespread effects to coastal-based recreational and tourism values, especially where oil makes contact with the shoreline. The effects would last the duration of the spill response and cleanup activities. Overall, potential effects of a large spill on recreation, tourism, and visual resources are anticipated to be long lasting and widespread.

For commercial and sport fishing, BOEM concluded that routine activities and reasonably foreseeable small spills from the Proposed Action could have short term and localized impacts. BOEM concluded that a large oil spill would most likely have long lasting and widespread impacts to commercial and sport fishing. For areas of special concern where much recreation and tourism happen, BOEM anticipates minor impacts from routine activities associated with the Proposed Action, little to no impacts from small spills, and long lasting and widespread effects to these areas if a large oil spill occurred.

Issue 21. Environmental Justice

Summary of Comments

Three comments highlighted Environmental Justice issues as they apply to Cook Inlet communities. These comments directed BOEM to avoid impacts to environmental justice communities in the Cook Inlet. Comments raised concerns about BOEM's failure to quantify or analyze the impacts of air and water pollution, greenhouse gas emissions, and other potentially impacted resources in the context of a large oil spill; one commenter indicated that not doing so undercut BOEM's ability to inform and engage environmental justice communities.

Source of Comments

- General Public
- Environmental Non-Governmental Organizations

Response to Comments

BOEM has determined that about 50% of the communities in the proposed Lease Sale Area qualify as environmental justice communities in the context of the Proposed Action. Based on the proportion of Alaska Native residents (CEQ, 1997), BOEM has determined that there are 16 environmental justice communities in the proposed Lease Sale Area (Section 4.3.20; Table 3.3.10-1). The 16 environmental justice communities in this analysis are generally dependent on subsistence harvests and distributions of anadromous fish and other marine resources and are located in or near coastal areas. BOEM has conducted an environmental justice analysis for these 16 communities because these communities have the greatest potential to be affected by the Proposed Action.

Other communities located further inland that may qualify as environmental justice communities based on poverty rates; however, these are not included in this environmental justice analysis because they are spatially distant from the proposed Lease Sale Area, and demonstrate greater dependence on terrestrial resources found inland such as moose, and thus are unlikely to be negatively impacted by Lease Sale 244. Moreover, inland communities would most likely be less affected by a large oil spill than coastal communities. BOEM has determined in Section 4.3.20.2 that there would most likely be high and adverse disproportionate effects to environmental justice communities in the event of a large oil spill. For routine operations and small spills associated with the Proposed Action, no disproportionate high and adverse effects are expected.

BOEM has analyzed the risk of a large spill. For example, the oil-spill risk analysis in Section 4.3.20.1 and Appendix A described an estimate of the chance of one or more large spills actually occurring and then contacting Nanwalek and Port Graham coastal areas (i.e., combined probability) to be less than 0.5% within 3 days and 1% within 30 days after the spill occurred. All other coastal areas associated with environmental justice communities had combined probabilities of less than 0.5% chance of a large spill occurring and contacting those areas.

BOEM analyzed the effects of the Proposed Action to air and water quality in Sections 4.3.1 and 4.3.2, respectively. BOEM anticipated short term and localized effects to air quality and water quality; in the event of a large oil spill, BOEM anticipated long lasting and widespread effects to water quality (and thus moderate). The large oil spill analysis and the air and water quality analyses and conclusions have been provided to the public for the public comment period in the Draft EIS, and have been updated in the Final EIS where appropriate. BOEM did analyze in detail potential effects of air and water emissions and effects to public health. Please see response to comments under Issue 19 in this appendix. BOEM did adequately inform and engage environmental justice communities in the NEPA process used for this Final EIS (see Chapter 6 of the Final EIS). BOEM is committed to working with communities and tribes in the proposed Lease Sale Area to find and implement measures to avoid and minimize any adverse effects anticipated from the Propose Action and future actions associated with this lease sale.

Issue 22. Cumulative Impacts

Summary of Comments

Several comments emphasized the challenges Cook Inlet's marine ecosystem already faces from ocean acidification, climate change, and existing development activities, and noted that additional oil and gas development in the area will add to these impacts. Some comments expressed concern that BOEM does not fully address cumulative impacts; several of these comments specifically pointed to the impacts of climate change and requested that BOEM conduct a more thorough analysis of the effects of climate change to comply with NEPA. One comment asserted that BOEM's finding that the contribution of the Proposed Action to cumulative effects will be "quite small" lacked adequate explanation. Another comment found BOEM's analysis of the cumulative impacts of noise on marine mammals to be inadequate.

One comment stated that BOEM failed to consider increased vessel traffic outside the action area that might result from greater economic activity in the action area and that vessel strikes, especially of North Pacific right whales, might be a concern if oceangoing vessel traffic were to increase.

One comment stated that BOEM failed to account for routine oil spills and their potential effects on specific resources, such as sea otters.

A few comments stated that specific activities were not addressed in the Draft EIS's cumulative impacts analysis. These comments include:

- Notably absent from Table 5.2.3-1 (Other Activities Potentially Affecting the Underwater Acoustic Environment) is discussion about the noise impact from the EXXON/Alaska LNG Pipeline.
- There is no discussion about the potential impact of the 2015 & 2016 LNG Mainline and Marine terminal area Geophysical and Geotechnical (G&G) surveys in the Upper Cook Inlet, which would likely affect Marine Mammals –especially Beluga whales.
- A number of specific planned development projects that would impact resources in Cook Inlet include: the Pebble Mine Port and Marine Terminal in Iniskin Bay; Port of Anchorage expansion; Port MacKenzie expansion; Knik Arm Bridge; Chuitna Coal project with a marine terminal (including dumping mining waste and runoff); Seward Highway improvements along the Turnagain Arm; the south coastal trail extension in Anchorage; Diamond Point rock quarry near Iliamna and Cottonwood Bays; and the placement of a submarine fiber optic cable from Nikiski to Anchorage.

Source of Comments

- General Public
- Environmental Non-Governmental Organizations

Response to Comments

Issues related to climate change. In this appendix, climate change information is largely addressed in the Climate Change (Issue 8) section. Additionally, changes related to the cumulative effects of climate change have been made to Lease Sale 244 Final EIS, Chapter 4 under individual resource analyses, Chapter 5 in individual resource analyses, and in Section 5.1.2.13.

Clarification of cumulative effects statement. The “quite small” comment concerning cumulative effects came from the executive summary, page ES-6, and was supported by the specific analyses of Chapters 4 and 5, which together concluded, by resource, that routine operations and reasonably foreseeable small spills would have negligible to minor incremental impacts to all analyzed resources due to localized, short-term and temporally or geographically separated effects on other activities in the proposed Lease Sale Area of effects. The Executive Summary sentence has been clarified in this Final EIS.

Issues related to acoustic impacts. In this appendix, acoustic impacts are addressed in Issue 11. Cumulative acoustic impacts are examined in the Final EIS Section 5.2.3 with a list of non-Lease Sale 244 actions that might affect the underwater acoustic environment included (Table 5.2.3-1). In addition to the analysis provided in this EIS, listed and unforeseen actions with acoustic impacts will be considered during subsequent environmental analyses, should any post-lease activities be proposed.

Issues related to impacts of alternatives. Each action alternative following the Proposed Action may incrementally reduce some cumulative impacts by reducing direct and/or indirect impacts. The cumulative effects analysis in Chapter 5 analyzes the Proposed Action, which is the most conservative estimate for leasing and development (i.e., the most lease blocks available with the fewest mitigation measures), and therefore covers any lesser cumulative impacts that Alternatives 3-6 may provide.

The potential that future mineral development may have greater impacts than those of current sales is considered in Section 5.1.2.13 and individual resource analyses.

Issues relating to increased vessel traffic outside the action area, and resultant potential vessel strikes on North Pacific right whales. BOEM established a baseline of current vessel traffic in Section 3.4.3, Figure 3.4.3-1, and in individual resource descriptions. The impacts of increased vessel traffic were discussed in Sections 4.2.9, 4.2.3, 4.2.6, Tables 4.2-1 and 4.2-2, individual resource analyses, Sections 5.1.2.4, 5.1.2.5, 5.1.2.7, Tables 5.2.6-1 and individual cumulative effects analyses.

Ships potentially striking North Pacific right whales as a result of the Proposed Action were listed as a potential source of mortality in Section 3.2.3.1. However, BOEM considered whether vessel traffic associated with the Proposed Action could impact North Pacific right whales and determined that such impacts are not reasonably foreseeable. The chances of a vessel associated with the Proposed Action striking a North Pacific right whale are prohibitively small.

Issues related to oil spills and oil spill response. In this appendix, oil spills are analyzed in Issue 23. BOEM does not consider any oil spill to be "routine," as every oil spill is accidental and illegal. Unfortunately, experience shows that accidental oil spills do occur, and every effort must be made to minimize and repair the damage from any spills. As such, developers are required to maintain and field appropriate oil spill recovery technologies and equipment, and conduct oil spill response drills. Consideration of cumulative impacts to resources stemming from oil spills is intrinsic to each resource, and stems from robust analysis of oil spill impacts by resource in Chapter 4. Each resource analyzed in Chapter 4 has a dedicated section on the impacts of small oil spills, and that dedicated analysis is continued in the Section 5.2 individual resource sections. As a direct result, each resource analyzed in cumulative effects Chapter 5 carries an explicit analysis oil spills into its cumulative effects consideration. In example, one commenter stated "BOEM failed to account for routine oil spills and their potential effects on specific resources, such as sea otters." In addition to thorough analysis in Chapter 4, sea otters are considered in Table 5.2.6-1 and Sections 5.2.6.3, 5.2.6.4, and 5.2.6.5 of the cumulative effects chapter.

Issues related to the Alaska LNG pipeline. Currently, further analysis of Alaska LNG pipeline cumulative effects would be unreasonably speculative. At the time of the Draft EIS publication, the Alaska LNG pipeline (LNG) was on schedule for submission of front end engineering and design (FEED) and an eventual application to build. However, the LNG pipeline majority interest is being transferred from a consortium of companies (ExxonMobil, ConocoPhillips, and BP) to the State of Alaska due to reduced industry interest given the low current cost of oil and gas. The nearest point of the proposed LNG pipeline to Federal waters is about 34 miles. The earliest existing estimate of commercial production was 2023 or later (Dawson, 2016), which estimate was made prior to Exxon, BP, and ConocoPhillips decision not to invest in FEED. Following a report by Wood McKenzie that concluded that the Alaskan LNG project is one of the least competitive of proposed LNG plants worldwide (Dawson, 2016), no funds are available from industry or the State of Alaska for FEED, and the LNG project is currently searching for new funding entities. Although there have been scoping meetings in preparation of an EIS, no application to build has been submitted to the Federal Energy Regulatory Commission (FERC), who cannot therefore provide any time estimate for beginning or completing either FEED or construction (Waldstein, pers comm, 2016). Reports concerning the ongoing Alaska LNG project are at http://elibrary.ferc.gov/idmws/ (Docket PF14-21-000). The current status of the Alaska LNG Project is discussed in Section 5.1.2-Alaska LNG Project.

Issues relating to the 2015/2016 ExxonMobil LNG Marine and Marine terminal area geological and geophysical (G&G) survey. The primary effect of any G&G seismic survey would be noise in the environment. Such noise would be transient and localized. Geological and geophysical surveys are expected to result from any lease sale, and would be analyzed as proposed by industry. The cumulative impacts of G&G seismic surveys are discussed in individual analyses, with impacts to marine mammals, notably the 2015/2016 LNG G&G seismic survey in Section 5.2.6.5.

The 2015/2016 LNG G&G Seismic Survey and similar issues are addressed in Sections 5.1.2.1 and 5.2.6. Section 5.2.6.3, paragraph 4, states:

> "Anthropogenic noise is ubiquitous in Cook Inlet from oil and gas activities in state waters, shipping traffic, and recreational and commercial boating, among other sources, and will occur under activities associated with other past, present, and reasonable foreseeable future activities as outlined in Table 5.2-1. The most significant contributors to anthropogenic noise in Cook Inlet from the Proposed Action would be seismic, geohazard, and geotechnical surveys. These types of surveys may reasonably be expected to occur as a part of oil and gas activities in state waters and would not be exclusive to the Proposed Action. Because of the limited number of seismic, geohazard, and geotechnical surveys estimated to occur under the Proposed Action and the current level of anthropogenic noise in Cook Inlet from other sources, the Proposed Action would result in a minor incremental increase in impacts to marine mammals that would occur under the cumulative effects analysis, mostly during the exploration and development phases."

Specific planned development impacts. The Pebble Mine Port and Marine Terminal in Iniskin Bay is discussed in Section 5.1.2.3; Port of Anchorage expansion, Table 5.2.3.1, Section 5.2.12.3 and individual resource analyses. The Port MacKenzie expansion is discussed in Section 5.2.13.3, Table 5.2.3.1 and individual resource analyses. Knik Arm Bridge is discussed in Section 5.1.2.6, Section 5.2, Table 5.2-1, and individual resource analyses. The Chuitna Coal Project is listed in Tables 5.1.2-1 and 5.2-1, and discussed in Sections 5.1.2.3 and 5.2.12.3 with a marine terminal (including dumping mining waste and runoff). Diamond Point rock quarry near Iliamna and Cottonwood Bays are listed in Tables 5.1.2-1, 5.2.3-1, and 5.2-1, and discussed in Sections 5.1.2.3, 5.1.2.10, 5.2.12.3, and individual resource analyses.

Seward Highway improvements along the Turnagain Arm, which have been applied for and may begin in 2018 (Andrews, 2016), do not occur in geographic proximity to any reasonably foreseeable Lease Sale 244 activities, and are therefore not considered in this EIS.

The submarine fiber optic cable from Nikiski to Anchorage was completed in 2009. It is listed in Tables 5.1.2-1 and 5.2-1, and discussed in Section 5.1.2.7, AKORN Fiber Optic Cable.

The South Coastal Trail Extension in Anchorage project started in 1997 under the Alaska Department of Transportation and Public Facilities (AK DOT&PF) and was moved to the jurisdiction of the Federal Highway Administration (FHWA). A final EIS was published in 2006 with a preferred action alternative. On March 30, 2006, the FHWA chose the no action alternative, citing lack of support for the project from the AK DOT&PF and the Anchorage Assembly. No action was taken, and the project was dropped from Anchorage planning documents. Although comments concerning the project occur in council and local newspapers from time to time, the south coastal trail extension is not a reasonably foreseeable action at this time.

Relevant subsections within Chapter 5 have been updated to better explain how the selection of various alternatives would serve to reduce the Proposed Action's contribution to cumulative effects.

Issue 23. Oil Spills

Summary of Comments

Many comments were concerned with the probability of one or more large oil spills occurring over the 34-year life of the development and production scenario. One comment suggested BOEM did not adequately consider the frequencies of large oil spills occurring and dismissed large spills occurring as unlikely. Some expressed concern that the 22% chance of one or more large spills was significant, high, not immaterial, or a strong probability. Others stated that a large spill was certain to occur or inevitable. Various comments challenged the characterization of a large spill as unlikely. Yet another comment recognized the probability of a large spill is low.

One comment disputed the differences in the probability of one or more large spills occurring between the previous Cook Inlet OCS Lease Sale 149 EIS and this Lease Sale 244 EIS. A few comments questioned whether oil spills should be characterized as routine or accidental in the impact analyses and conclusions or the executive summary tables.

Several comments supported the analysis of large and very large oil spills. One comment commended BOEM for the inclusion of a range of spill sizes including the analysis of a very large oil spill, stating it would help communities prepare for a low probability event. Other comments suggested BOEM dismissed the impacts of large or very large oil spills based on regulatory changes or the probability of one or more spills occurring. One comment disputed the sequence of the phases in the very large oil spill analysis.

A few comments indicated that any new offshore or onshore activity, aging pipelines, or earthquakes increase the likelihood of an oil spill. A few comments pointed out previous oil spills, such as the Exxon Valdez or Deepwater Horizon oil spills, had lasting damage or should serve as reminders that accidents do occur despite the best prevention policies and actions.

One comment stated that BOEM did not consider the potential movement of oil. Some comments critiqued BOEM's oil-spill trajectory modeling methods, i.e., the OSRA model. These comments asserted faults and limitations concerning the OSRA methodology, model inputs or parameters, environmental resource area vulnerability, or the availability of information. One comment called into question the different results from two oil weathering models asserting one or another model was biased.

Several comments noted information requests or concerns about the OSRA model results including the usefulness of tables over probability maps or the characterization of the chance of a large spill contacting resources. Another comment found the analysis did not give a clear picture of what an oil spill would look like.

Several comments questioned the use of the NOAA ESI over the Alaska Shorezone Programs "oil residence index," whether habitat type was under-represented, the way in which the Environmental Sensitivity Index (ESI) was divided into land segments, or what areas the ESI analysis included.

Source of Comments

- General Public
- Federal Government
- State Government
- Local Government
- Citizen Advisory Councils
- Environmental Non-Governmental Organizations

Response to Comments

Probability of One or More Large Spills. In this EIS, BOEM has characterized the 22% chance of one or more large spills of 1,000 barrels or more occurring (if oil is discovered and produced) over the 34-year development and production life as unlikely. In this characterization, BOEM considered several factors. The estimated mean number of large spills is much less than one, adding up both estimated pipeline and platform spills over the 34-year development and production life of the project. The most likely event that BOEM estimates to occur over the life of the project (over 78% of the time) is that a large spill will not occur. The chance that one or more large spills will not occur is characterized as the "likely" outcome.

Furthermore, the estimated chance of one or more large spills occurring assumes development and production occurs and does not factor in the chance of reaching the development and production stage. For a large oil spill to occur, a series of events must occur. First, a lease sale must occur. In Cook Inlet, 100 leases have been issued from three OCS sales and one resale. Then, exploration must occur and find oil (there have been 13 exploration wells in Cook Inlet with no discoveries to date). If oil is found, it must be present in sufficient quantities to justify investing in development. To date, only one development in the Alaska OCS (but not in Cook Inlet) has resulted from 86 exploration wells (2,351 leases) statewide. Finally, if development and oil production occur at the levels in the exploration and development scenario, BOEM estimates it would not result in a large oil spill. Given all the circumstances that would need to align in order for Lease Sale 244 to result in the level of production contemplated in the Final EIS, and the fact that such a scenario would result in a 22% chance of one or more large oil spills, BOEM believes that characterizing large spills as "likely" would be misleading.

Finally, although BOEM characterizes a large spill as unlikely the Final EIS does assume one spill occurs and analyzes the impacts of a large spill and reaches a conclusion on the impacts of a large spill for each resource. The impact conclusion does not factor in the probability of a large spill occurring. This "what if" analysis addresses whether such spills could cause serious environmental harm and informs the decision maker of potential impacts should a large spill occur. Assuming a large spill or gas release (which is higher than the most likely number of spills reasonably foreseeable) helps to ensure that this Final EIS does not underestimate potential environmental effects.

Large Spill Estimates. There are no discrepancies in the estimated chance of one or more large spills occurring between the Cook Inlet Lease Sale 149 and 244 Final EISs. The analysis of a large oil spill in the Cook Inlet Lease Sale 149 was predicated on three resource volume estimates, a low, base, and a high case. The low case was based on an exploration only scenario, the base case was based on the estimated resources likely to be leased, discovered and produced (200 Mmbbl) as a result of the Cook Inlet Lease Sale 149 and assumes the existence of economically recoverable hydrocarbons in the Sale 149 area. The high case was based on similar estimated resources that are significantly higher than the base case (800 Mmbbl). For Cook Inlet Lease Sale 149 the 72% chance of one or more large spills occurring was based on a resource volume of 800 million barrels and the 27% chance of a one or more large spills occurring was based on a resource volume of 200 million barrels. The Cook Inlet Lease Sale 244 area is estimated to have 215 million barrels and the chance of one or more large spills occurring is 22%. Since the Cook Inlet Lease Sale 149, the OCS spill rates have decreased so there is a slightly less chance of one or more large spills for a similar volume of oil (Anderson, Mayes and LaBelle, 2012). On September 27, 2016, well after the Draft EIS comment period had closed on September 6, 2016, BOEM and BSEE released a new report by ABS Consulting Inc. titled *2016 Update of Occurrence Rates for Offshore Oil Spills.* BOEM determined that the spill rates in ABS Consulting Inc. (2016) were lower than those analyzed in the Lease Sale EIS and therefore the information used in the Lease Sale 244 EIS is conservative and allowed stakeholders the opportunity to review the information and provide comment. The analysis in ABS Consulting Inc. (2016) continues to show that OCS large oil spill rates are decreasing.

BOEM strives to use the best available information in our oil spill analysis and has invested considerable time, effort, and funding in the past few years to improve our oil spill analysis. BOEM conducted a rigorous analysis of both onshore and offshore pipeline spills. BOEM used OCS spill rates to estimate large spills for pipelines as well as the Pipeline and Hazardous Materials Safety Administration to determine median spill sizes for onshore pipelines. These analyses discussed in Section 4.2.14.2 and Appendix A, A-1.2-2, A-4.1-1, A-4.1.4.

Oil Spills. BOEM acknowledges the effects of the Exxon Valdez Oil Spill on some vulnerable wildlife, particularly sea otters and harlequin ducks, were observed for more than two decades. Both Chapters 3 and 4 discuss the EVOS as well as other spills in relation to the effects of oil or of lingering oil. In the case of EVOS, some oil is known to remain in the environment, although the exact amount is uncertain (Michel et al., 2016).

New OCS oil development does not necessarily mean that oil spills and accidents will increase. Through time, the large OCS spill rates have been decreasing although oil and gas development and production has been increasing (Anderson and LaBelle, 1990, 2000; Anderson, Mayes and LaBelle, 2012). Nor do earthquakes necessarily mean that more oil spills may occur. Any and all structures placed on the OCS must be engineered to withstand a maximum climatic or physical event, such as a 100-year storm or an earthquake. This standard does not imply the structures will be “quake proof” or that damage would not occur. However, engineering and prevention measures are taken into account for earthquake prone areas such as the Pacific and Alaska OCS.

Although the number of OCS spills is declining overall, the number of oil spills increased in the decades cited by Alan Levin because several hurricanes impacted the Gulf of Mexico. Even one hurricane can have dramatic effects on the number of spills recorded on the OCS. Ivan occurred in 2004, Rita and Katrina occurred in 2005, and Ike occurred in 2008. Hurricanes are not anticipated to occur in the Cook Inlet OCS. In addition, in 2004, MMS changed spill reporting standards to included inventories on OCS structures that were destroyed, heavily damaged, or missing. These passive spills have impacted the number and volume of spills, though these spills were neither observed nor required response.

Aging pipelines can be addressed by using a variety of engineering methods to predict the remaining safe life of the pipelines. These methods include both simple and complex fitness for purpose analyses, but must consider other aspects of the care of an ageing asset, e.g. inspection and repair. On December 29, 2006, the “Pipeline Inspection, Protection, Enforcement, and Safety Act of 2006” (Pipes Act H.R. 5782) was signed into law. The Pipes Act issued a final rule requiring hazardous liquid pipeline operators to develop integrity management programs for transmission pipelines. Integrity management inspections are comprehensive, and a team of inspectors is often used to conduct the inspection.

Basic requirements for an Integrity Management Plan include:

- Periodic integrity assessment of pipelines that could affect high consequence areas (HCAs). Integrity assessments are performed by in-line inspection (also referred to as “smart pigging”), hydrostatic pressure testing, or direct assessment. Through these assessment methods, potentially injurious pipeline defects that have the potential to eventually weaken the pipe, or even cause it to fail, are identified early on and can be repaired, thus improving the pipe’s integrity.
- Development and implementation of a set of safety management and analytical processes, collectively referred to as an integrity management program (IMP). The purpose of the program is to assure pipeline operators have systematic, rigorous, and documented processes in place to protect HCAs.

Routine versus accidental. BOEM modified the text in Section 4.2 and Tables 4.2-1 and 4.2-2 to clarify the difference between routine and accidental impact producing factors. Spills, while reasonably foreseeable, are not considered routine. They are not intended as part of the proposed action, but even with best practices, the possibility of a spill cannot be wholly eliminated. Therefore, BOEM considers the number and size of spills that may be reasonably foreseeable and their impacts.

OSRA Model. BOEM conducted a thorough stochastic trajectory analysis for large oil spills, discussed in Section 4.2.14.2 Large Oil Spill (≥1,000 bbl)/Gas Release and in further detail in Appendix A, Section A-3, Estimates of where a Large Offshore Spill May Go.

To be useful, the OSRA model results must characterize the entire proposed Lease Sale Area. Some generalizations are required, considering initially that the leases have not been let, and many of the numbers and properties of the wells and the oil properties are not known with certainty. Rather than focus on one specific location and making assumptions about the oil properties, the OSRA is “stochastic.” The OSRA has many release points (219) within the lease sale and adjacent area to define the overall trajectory population (3,650 from each point) for a total of 799,350 simulated trajectories. For the oil properties, the OSRA model trajectory calculation assumes a point (non-weathering oil), which is considered to be a conservative choice.

The description of the calculation of trajectories as a point is described in detail in Smith et al. (1982) and referenced in Appendix A, Section A-3. Additionally, the equations in Appendix A, Section A-3.3 shows the components of motions simulated and used to describe the oil transport for each of the simulated trajectories.

Because the reference Danielson et al. (in press) was unpublished at the time of the Draft EIS, BOEM included information on the components of the ROMs model in Appendix A, Section A-3.1.6, Ocean Current and Ice Information from a General Circulation Model. The document, Danielson, Hedstrom, and Curchitser (2016) is now published and posted on BOEM’s website and within ESPIS. BOEM also included all the information in the OSRA Report in Appendix A.

Appendix A, Section A-3 provides detailed information about the OSRA model and its underlying components; all of which are the best available information and the most appropriate for the lease sale stochastic oil spill trajectory analysis. The OSRA model is a component model in which the underlying components are continuously updated with the best available new information. Ji, Smith, and Johnson (2016) and Appendix A, Sections A.3.1 through 8 describe the OSRA model components. Danielson, Hedstrom, and Curchitser, (2016) completed a state-of-the-art high resolution (~1.5 km) coupled ocean sea-ice model, which was specifically designed for running the OSRA model to simulate a decade of the currents in the Cook Inlet, Shelikof Strait, and the adjacent Gulf of Alaska. The model was setup regionally for the northeast Pacific with enhanced resolution (~1.5km) in the northwest Gulf of Alaska.

The coupled ocean sea-ice model has the capability to reproduce the coastal hydrodynamic features. Danielson, Hedstrom and Curchitser (2016) discuss model results and model-data comparisons in Section 3.0. The model skill is extensively verified with the historical and recent field observation data in these areas, such as the satellite tracked oceanographic drifters from University of Alaska Fairbanks (UAF) field campaigns between 2003 and 2015 (Doroff, Johnson and Gibson, 2015; Johnson et al., 2008; Johnson, 2016) and a set of conductivity-temperature-depth (CTD) observations conducted in Cook Inlet between 2004 and 2006 (Okkonen et al., 2009).

Appendix A, Section A-3.1.1 discussed that the study area is chosen to be large enough to allow most hypothetical oil spill trajectories to develop without contacting boundary segments through as long as 30 or 110 days. BOEM modeled upper Cook Inlet because it cannot be known that a large oil spill would not reach upper Cook Inlet. Since BOEM last modeled Cook Inlet (USDOI, MMS, 2003), the current general circulation model now includes a wetting drying model specifically designed to model the upper Cook Inlet.

Environmental Resource Areas. The information used to define both the spatial and temporal characteristics of the physical, biological, social or economic resources is noted in Appendix A, Tables A.1-7 through A.1-15. BOEM uses a variety of information in a variety of formats to synthesize information about environmental resources. When available, BOEM prefers to use information in a geospatial format so that, as the commenter suggested, the information can be integrated. However, for many resources, much of the information is found within the peer-reviewed or gray literature and is not readily available in a geospatial format. The information cited in Appendix A, Tables A.1-7 through A.1-15 is also used to determine the vulnerability of the ERAs.

Appendix A, Section A-3.1.3 describes that the vulnerability is the time period those resources use or occupy that spatial location and not a function of when the oil is most likely to be transported to the shoreline as the commenter suggests. Where multiple resources make up an ERA, the vulnerability is set for a longer period than one particular resource. For example, for ERA10 SUA: Old Harbor, those resources are vulnerable January through December (all year) because the resources that make up ERA10 could be harvested throughout the entire year.

OSRA Results. The conditional probabilities that a large or very large oil spill starting at a particular location (launch areas or pipelines) will contact a certain environmental resource are estimated for three seasons (annual, summer, and winter) and six time periods (1, 3, 10, 30, 90, and 110 days), and the combined probabilities of both oil-spill occurrence and oil-spill contact are estimated annually for the same time intervals. Those estimated probabilities are presented in 64 tables in the Section A.2 of Appendix A. Subject matter experts use this information to estimate the impacts from large or very large spills for up to 20 resource categories discussed in Sections 4.3 or 4.12 of the Final EIS. The OSRA provides a wealth of information for the subject matter experts to use in the form of tables (Appendix A, Sections A.1 and A.2) and illustrations (Appendix A, Maps) to make a reasoned assessment of the impacts of large or very large oil spills over the life of the Proposed Action and alternatives for individual resource categories in the Final EIS.

The OSRA model does not underestimate the probabilities of oil being transported downstream or upstream. In fact the OSRA model estimates that if a large oil spill occurs there is a chance that a large spill would contact resources downstream from Cook Inlet. For example, within 3 days during summer, the OSRA model estimates contacts to ERAs within Shelikof Strait and Barren Islands from Launch Area 5 (Appendix A, Table A.2-21). Within 30 days during summer, the OSRA model estimates contacts to ERAs are as far south as southern Shelikof Strait and the Semidi Islands from Launch Area 5 (Appendix A, Table A.2-24).

Oil Weathering Model. BOEM has added the reference Reed et al. (2005b) to Appendix A, Section A-2.5 Modeling Simulations of Oil Weathering. Appendix C of this report discusses the technical documentation including how the model calculates four physical processes: spreading, evaporation, oil-in-water dispersion, and water-in-oil emulsion formation. This report is at http://www.boem.gov/BOEM-Newsroom/Library/Publications/2005/2005_020.aspx.

Loss of well control. Cook Inlet blowouts were discussed in Appendix A, Section A-1.2.3. Historical Loss of Well-Control Incidents on the OCS, North Sea, and Cook Inlet and shown in Appendix A, Table A-1.

Very Large Oil Spill. BOEM analyzes the impacts a very large spill in Section 4.12. The VLOS analysis does not factor in the chance of a VLOS occurring but rather assumes a VLOS occurs for purposes of analysis.

Although numbered, the phases within the very large oil spill analysis described in Table 4.14-1 are not necessarily sequential and could be overlapping in both time and space.

Environmental Sensitivity Index. The text in Appendix A, Section A.2.2.2 has been revised to clarify the difference between ESI for the entire OSRA study area and ESI within Cook Inlet/Shelikof Strait, which is the Cook Inlet Planning Area. The ESI is used to generally estimate the potential persistence of oil within a given land segment rather than describe the habitat type within that land segment. Persistence of oil within a substrate is a factor used in determining the impact of an oil spill. In the future, BOEM will endeavor to analyze and synthesize the shorezone data, as was suggested by the commenter, so it is in a usable format for oil spill impact assessment.

Issue 24. Spill Prevention, Response, and Cleanup

Summary of Comments

Some comments received were about the inherent challenges of oil-spill response and cleanup under subarctic conditions in an area with strong tidal currents. Commenters expressed concern about the effectiveness of current spill response methods. Some comments address this issue generally:

- A winter storm would make cleanup ineffective similar to the Exxon Valdez Oil Spill.
- Protection of the National Parks.
- The basis of the effectiveness of containment is unsupported by science.
- Recovery rates discussed in the document are not consistent and reference different citations.

One comment stated that preparation for a VLOS is the best prevention with training, stringent inspections, equipment, proper staffing, planning and coordination with local emergency responders. Another comment suggested planning for VLOS must reduce the allowable time for a release to 40 days or less including having a separate standby rig available to drill a relief well. One comment suggested the bureau devote an equally strong focus to what happens and what should be done if something goes wrong.

Source of Comments

- General Public
- Local Government
- Environmental Non-Governmental Organizations

Response to Comments

BOEM shares concerns regarding the potentially devastating effects of a catastrophic oil spill. BOEM also acknowledges that, while multiple methods for recovering and cleaning up spilled oil exist, severe weather and/or the presence of ice could interfere with or temporarily preclude each of these methods, and supports ongoing research related to spill response and the protection of environmental resources. The highest emphasis, however, is on pollution prevention. The following discussion responds to comments regarding spill response and cleanup techniques.

Scope of the Final EIS discussion on spill response and cleanup. The Final EIS analyzes potential environmental effects associated with oil and gas activities. It is not the purpose of this document to plan and analyze response scenarios. Oil-Spill Response Plans (OSRPs) would be evaluated on a plan-by-plan basis at the Exploration Plan stage and again at the Development and Production Plan stage. The regulations for OSRPs are at 30 CFR 254. The requirements are strict and BSEE's analysis of a proposed OSRP is vigorous.

Spill response and cleanup under subarctic conditions. To inform the environmental effects analysis and eventually BOEM and DOI decision makers, spill response activities are described in Appendix A, Section A-7.1.2.8 of the Final EIS. BOEM provides a description of acceptable types of spill response equipment and methods to provide the public and the decision maker with a basic picture of what a response would look like, as well as to facilitate analysis of potential impacts from spill response activities. The level of detail in the Final EIS is sufficient to accomplish these goals.

Research has shown that the strategies in the spill response "tool box" have varying effectiveness under varying conditions in the Cook Inlet region. In the event of a spill, a combination of response strategies would be used to maximize the effectiveness of the overall response under the specific existing conditions. The Alaska Regional Response Team has developed the Alaska Federal/State Preparedness Plan for Response to Oil and Hazardous Substance Discharges/Releases (Unified Plan) and associated Subarea Contingency Plans, which provides Alaska-specific information for plan holders, incident management teams, and stakeholders regarding: response expectations and regional challenges; policies and guidelines; standardized nomenclature; possible infrastructure and resource sourcing options. Additionally, the Alaska Department of Environmental Conservation published the Spill Tactics for Alaska Responders (STAR) manual as a guide to assist and implement oil spill response tactics suitable for Alaskan environmental conditions.

Recovery rates/effectiveness of spill cleanup. The volume of the assumed large oil spills and the hypothetical VLOS are not adjusted to account for successful response and cleanup. This approach acknowledges the potential difficulties of responding to a spill under various conditions (i.e., cold, darkness, ice, wind) and furthers the goal of analyzing a low-probability, high impact event. And it does so without shifting the focus of this environmental effects document into a debate about the efficacy of spill response techniques. Successful spill response and cleanup efforts would indeed help reduce the amount of spilled oil contacting or otherwise affecting valued resources. Yet it is also true that in the event of a spill, response and cleanup efforts can incidentally cause certain adverse impacts to environmental resources. These impacts are a foreseeable consequence of spill response and cleanup activities and are analyzed accordingly.

Research. In acknowledgement of the need for additional information on spill response tactics, effectiveness, and consequences, both BOEM and BSEE have ongoing studies to address these issues.

BSEE is the principal Federal agency that funds oil-spill response research (through the Oil-Spill Response Research [OSRR] Program). For more than 25 years, the DOI has maintained a comprehensive, long-term research program to improve oil-spill response options. The major focus of the program is to improve the method and technologies used for spill detection, containment, treatment, recovery, and cleanup of oil spills that may occur on the U.S. Outer Continental Shelf.

BSEE's OSRR program is a cooperative effort bringing together funding and expertise from research partners in government agencies, industry, and the international community for participating in research and development (R and D) projects. Many of these projects are Joint Industry Projects, where the BSEE partners with other stakeholders to maximize research dollars. BSEE has cooperated in the exchange of technological information with Canada, France, Germany, Japan, Norway, and the United Kingdom through informal contacts, workshops, and technical meetings such as the International Oil Spill Conference. Most procurements of R and D projects are competitive.

Current OSRR projects cover a wide spectrum of oil-spill response issues and include laboratory, meso-scale, and full-scale field experiments. Major topic areas include the following:

- Remote sensing and detection
- Physical and chemical properties of crude oil
- Mechanical containment and recovery
- Chemical treating agents, dispersants, herders, and absorbers
- In situ burning
- Deepwater operations
- Operation of Ohmsett – The National Oil-Spill Response Test Facility

Information on OSRR is found at http://www.bsee.gov/Research-and-Training/Oil-Spill-Response-Research/index/.

Oversight. BOEM considered a comment requesting that a standby relief well drilling rig be present during any drilling on leases issued through Lease Sale 244. The sufficiency of oil spill response equipment and techniques is analyzed by BSEE on a plan and permit specific basis, and BOEM declines to pre-judge the necessity for a standby relief well rig in this instance. BOEM also notes that environmental, geologic, and operating conditions in Cook Inlet are different than on the Arctic OCS. Unlike the Arctic OCS, the proposed Lease Sale Area is not rendered seasonally inaccessible by sea ice, meaning there is no end of season deadline for responding to oil spills. There are also other oil and gas activities occurring in Cook Inlet, which increases the likelihood that additional resources would be available to respond in the event of an oil spill from a long duration loss of well control. These and other factors will be considered in any decisions made by BOEM and BSEE on future plans and permits for activities on leases issued through Lease Sale 244.

Issue 25. Energy Policy Considerations

Summary of Comments

Many comments challenged the need for more hydrocarbons and expressed preferences for other means to meet energy demands, aside from development of OCS resources in Cook Inlet. Most of these comments suggested that the Federal Government invest in other energy sources (particularly renewable sources of energy such as solar, wind, geothermal, tidal, etc.) and/or increase its emphasis on energy conservation. One comment asserted that BOEM has been charged by Congress to promote renewable energy development in Cook Inlet Federal waters. Many comments suggested thinking of long-term energy needs, and how new oil and gas production would affect future generations. Several expressed concern at the safety of oil and gas development and production, discussing threats such as oil spills, and the need for this generation to act on climate change. Several comments pointed out offering oil and gas leases does not help our nation's progress towards more use of renewable energy. Another pointed out that recent oil and gas leases in Cook Inlet have not drawn interest. One comment questioned how much energy it takes to actually get to the point of production, and what benefits result.

Some comments expressed support of Lease Sale 244, stating it is in the best interest for the region, and it has the potential for new reserves to meet future demand.

Source of Comments

- Environmental Non-Governmental Organizations
- General Public
- Industry Non-Governmental Organizations

Response to Comments

Comments asserting a preference for other energy sources are beyond the scope of the current analysis. Under the OCSLA, the Secretary of the Interior is responsible for the administration of mineral exploration and development of the OCS. A programmatic decision was made in the 2012-2017 OCS Programmatic EIS to hold a sale in Cook Inlet in 2017, and this current EIS document analyzes the potential environmental impacts of such a sale. The Final EIS provides in-depth environmental analysis of oil and gas production, assuming that oil and gas production occurs, as well as analyzing the impacts of climate change. While renewable energy sources currently play a role in meeting energy demands in this country, and will continue to do so in the future, such sources could not at this time replace the energy supplied by oil and gas in the OCS. The DOI and BOEM continue to move forward on renewable energy. In October 2016, the U.S. Secretary of Energy Ernest Moniz and U.S. Secretary of the Interior Sally Jewell announced the publication of a collaborative strategic plan to continue accelerating the development of offshore wind energy in the United States, the National Offshore Wind Strategy: Facilitating the Development of the Offshore Wind Industry in the United States, which could help enable 86 gigawatts of offshore wind in the United States by 2050. The strategy details the current state of offshore wind in the United States, presents the actions and innovations needed to reduce deployment costs and timelines, and provides a roadmap to support the growth and success of the industry. More information on the OCS Renewable Energy Program is available at http://www.BOEM.gov/Renewable-Energy.

Issue 26. Hydraulic Fracturing and Earthquakes

Summary of Comments

A large number of commenters expressed concerns associated with the environmental impacts of hydraulic fracturing use, and especially the effects of hydraulic fracturing-related chemicals on human health and the environment. Commenters expressed concerns about toxic effects of leaked or discharged well stimulation-related chemicals on marine biota and as well as on human health. Several commenters provided information related to the toxicity of chemicals used by the well stimulation treatments, identifying potential effects ranging from cancers and mutations, immune and nervous system damage, and birth and developmental effects, as well as degrading habitats. Others expressed concern that injection of well stimulation treatment waste fluids could contaminate drinking-water aquifers. Several commenters expressed concern that injection of well stimulation treatment-waste fluids could in result in an increase in earthquakes. One commenter also stated that wastewater injection would increase the seismicity risk (e.g., fracking could contribute to increased stress in faults, thereby increasing the magnitude of naturally triggered earthquakes).

Some commenters expressed concern regarding earthquakes and the safety of oil and gas facilities. Another commenter suggested that the extraction of oil and gas could increase the intensity of earthquakes, making them more damaging. Other commenters stated we recently had over a 7 magnitude earthquake, the chances of an earthquake that size or higher still exists which could cause spills.

Source of Comments

- General Public
- Environmental Non-Governmental Organizations

Response to Comments

The effects of post-drilling well stimulation treatments such as hydraulic fracturing are not addressed in this analysis for several reasons. Though BOEM recognizes the use of hydraulic fracturing in other regions has significantly increased the ultimate economic recovery of hydrocarbons from older oil and gas fields and previously uneconomic new fields, it has not been identified as a reasonably foreseeable activity in the exploration and development scenario for Lease Sale 244. Prior to leasing and subsequent submission of an Exploration Plan, BOEM is unable to predict the exact geologic targets companies would decide to pursue on any particular lease block. Without knowing these specific targets and the extent of the proposed activity, it is impossible to appropriately quantify the impacts of any stimulation method given the endless combinations of material types and volumes or equipment necessary for a wide variety of well stimulation operations in any given hydrocarbon reservoir.

Though small-scale conventional hydraulic fracturing and acidizing techniques have been utilized historically in some Cook Inlet region oil and gas fields to improve flow rates in underperforming wells, the region has not experienced the large-scale unconventional fracturing operations which have been the subject of significant recent controversy and scrutiny in other regions. Conventional well stimulation methods typically have negligible additional impacts relative to the drilling operation itself, whereas unconventional methods may require significant volumes of water, chemicals, and other materials, additional equipment and machinery, and increased manpower. Only conventional stimulation methods are anticipated in Lease Sale 244.

However, if hydraulic fracturing were deemed necessary by a company for exploration and/or development of a given prospect, the procedure would be identified in the submitted Exploration Plan (EP) or Development and Production Plan (DPP) and the impacts analyzed prior to permitting decisions being issued per the requirements of NEPA. If necessary to avoid undesirable impacts to air or water quality or other environmental or public health and safety impacts, BOEM would develop reasonable alternatives to each proposal and may require plan revision to meet regulatory requirements. Where no reasonable action alternatives exist besides the Proposed Action, BOEM may require mitigation to offset the impacts or disapprove the EP or DPP.

In review of each EP or DPP, BOEM analyzes all aspects of each project from pre-construction studies to platform and facility decommissioning.

Oil and Gas Wastes Handling and Disposal. Handling, storage, and disposal of oil and gas wastes such as drilling and completion fluids, rock cuttings, and produced water are a significant concern and subject to strict regulation. In the area of Cook Inlet subject to Lease Sale 244, oil and gas exploration wastes are permitted for disposal in the Federal waters of Cook Inlet by the Environmental Protection Agency (EPA) via National Pollutant Discharge Elimination System (NPDES) General Discharge Permit No. AKG-28-5100. This permit specifies the types and volume of exploration wastes approved for disposal in the Federal waters of Cook Inlet and establishes the minimum testing procedures and maximum frequency and concentration thresholds for disposal. All other wastes including well completion, treatment, and test fluids are required to be disposed of by injection into an approved service well or barged onshore for proper disposal.

The Alaska Department of Environmental Conservation (ADEC) does not permit the use of open-pit evaporation ponds for oil and gas liquid wastes onshore in Alaska, so liquid wastes are disposed of in wells classified for disposal by the EPA or ADEC or treated and returned to the rock formation where they originated. Wastes from development and production activities at new facilities such as those anticipated in Lease Sale 244 are not covered under an EPA General Discharge Permit and are not approved for disposal in Cook Inlet waters at this time. Some existing facilities in the State waters of Upper Cook Inlet have maintained valid Alaska Pollutant Discharge Elimination System (APDES) Individual Discharge Permits which allow disposal into the waters of Cook Inlet with specific limitations for each site.

Design Review and Permitting. Prior to commencing any exploratory or development drilling and subsequent well stimulation operations, the operator must submit an Application for Permit to Drill (APD) to BSEE for approval. The geologic data and assumptions, engineering designs, and full operational procedures including well stimulation treatments (to the extent they are known or assumed prior to drilling) for each individual well are then thoroughly analyzed by trained subject matter experts (SME) for compliance with BSEE's minimum design and operational regulations and standards and any additional requirements of the approved EP or DPP. Neither BOEM nor BSEE require a separate permit for well stimulation treatments such as fracturing, but explicit approval of these operations must be obtained prior to commencing the work. Should an operator not have enough data to submit a complete stimulation procedure until a well is drilled, or otherwise must modify a previously approved procedure to incorporate new data collected during drilling, approval would be obtained by an Application for Permit to Modify (APM).

Earthquakes and Geohazards. In their analysis of each APD or APM, BSEE subject matter experts (SMEs) verify the platform, wells, pipelines, and facilities are appropriately designed or reinforced to withstand all reasonably anticipated forces and located to avoid geologic hazards. Any and all structures placed on the OCS must be engineered to withstand a maximum climatic or physical event, such as a 100-year storm or an earthquake. This standard does not imply the structures will be "quake proof" or that damage would not occur. Over time, construction technology will minimize potential damage to facilities. An active fault beneath a proposed drilling platform or pipeline or intersecting the proposed well path would be identified and avoided. Oil and gas facilities must be built to withstand anticipated structural loads as defined in 30 CFR 250 Subpart I. Subpart I also provides for an independent third-party platform verification process.

In recent years there has been a relative surge of seismic activity in some oil-country regions where earthquakes were previously uncommon. This induced seismic activity has been linked to hydraulic fracturing operations, though there are other significant factors contributing to these earthquakes which also occur in areas where fracturing has not taken place. Hydraulically fracturing rock near or into an active fault may cause a relief in fault stresses and a release of the valuable oil and gas resources typically trapped by such faults. Fracturing operations are typically performed in short periods and are restrained to small sections of any given rock formation, limiting their reach beyond an intended distance from the wellbore. The pressures applied to fracture the rock are also highly controlled to a narrow tolerance above the rock's known fracture pressure to ensure the fracture can propagate to the target radius length without damaging wellbore or formation structural integrity.

The common connection between hydraulic fracturing operations and the induced seismicity observed in other regions where fracturing has not occurred is the subsurface disposal of waste. Disposal wells are highly regulated and monitored by the EPA and/or the State of Alaska depending on the well classification. Even when care is taken to avoid placement of a well near a fault, constant injection of liquid and solid wastes at high pressures will increase the pressure in any sealed formation, potentially countering forces which hold faults stable or sealed. These induced earthquakes are occurring in the oldest parts of the U.S. oil-country where many oil and gas fields are nearing the end of their productive lives and old disposal wells may be nearing their designed service lives and/or capacities.

Companies may use water injection to drive producible hydrocarbons to the producing wells. This, combined with the natural encroachment of significant volumes of formation water from below depleted hydrocarbon zones, often leads to massive volumes of water produced at the surface. In some instances this water is returned to the formation by re-injection for pressure maintenance, but that is not often the case in the oldest fields where hydrocarbon production volumes cannot economically justify the cost of new injection wells or equipment. Disposal of produced water, liquid and solid drilling wastes from new wells, and flow-back fluids from well stimulation treatments such as fracturing may induce seismic activity when not properly performed.

For this reason and to avoid contaminating water resources, oil and gas companies take great care to prevent disturbing active faults by distancing all wells and facilities from geologic hazards. In Alaska, where seismic activity is intense, it would be difficult to detect induced seismicity among such a heavy background of natural seismicity so there are no documented cases of induced seismicity from past or present oil and gas operations. BOEM SMEs independently review all available seismic data to verify impacts to and from geologic hazards are minimized or eliminated where possible.

Aquifer Contamination and Additional Impacts. Proposed well designs and drilling and testing procedures are verified to ensure fresh water and other valuable resources are protected from waste or contamination, and that drilling systems and equipment are appropriate and safe for the specific anticipated drilling conditions. All designs are verified for compliance with 30 CFR 250 Subparts C, D, and E and other regional rules and standards. Though neither BOEM nor BSEE regulate disposal, if a well were drilled on a Federal OCS lease it would be designed to meet or exceed these regulations in addition to any EPA requirements. Should proposed plans fail to conform to BSEE's regulations and standards or otherwise pose an undesirable risk to public health and safety or the environment, the plan would be approved with reasonable modifications or denied.

As a result of new technologies and ever-changing economics, some of the oldest producing oil fields in the U.S. have produced significantly more oil than their original estimates predicted. In addition to enhanced recovery methods such as water injection, modern hydraulic fracturing and horizontal in-fill well drilling capabilities can be credited with tapping into stranded reserves which were previously uneconomic to extract. This has led to a longer producing life for some fields, which can put a strain on wells, pipelines, and facilities remaining in service beyond their design life. Appropriate inspection and monitoring may be sufficient to ensure safe operations until decommissioning, but maintenance and process upgrades are typically necessary to prevent leaks and failures. This is not an issue for Lease Sale 244 since there are no existing OCS wells or facilities and if necessary, any new wells or facilities would incorporate these types of enhanced recovery methods in initial designs to appropriately forecast impacts and field life. Utilizing these recovery technologies from the start of field production increases ultimate economic recovery by producing at higher flow rates early and with a less severe decline which may shorten the time needed to fully deplete the reservoir.

Another concern associated with old oil and gas infrastructure in some parts of the U.S. is the risk of surface or subsurface discharges through improperly abandoned or unprotected wellbores during hydraulic fracturing operations. The instances where this occurred in other states were isolated and uncommon, though the destruction caused to local aquifers and watersheds or air quality in some instances was significant. Lease Sale 244 will not require an analysis of risks or impacts associated with proximity to the old wells as there were only ever five exploration wells drilled in the proposed Lease Sale Area, none of which discovered significant oil and gas resources and all of which were abandoned using modern standards. If fracturing were later deemed necessary, any wells proposed to be fracture stimulated would require an investigation into the status and integrity of all nearby wellbores to ensure safe operations.

Issue 27. Archaeological Resources

Summary of Comments

One commenter challenged BOEM’s finding that seafloor disturbance related to the Proposed Action would result in a negligible increase in overall impacts on archaeological and historic resources because the commenter felt that BOEM should analyze the effects on these resources as a set, and felt BOEM did not comply with the statutory requirements for these resources.

Source of Comments

- Environmental Non-Governmental Organizations

Response to Comments

BOEM considered effects on archaeological and historic resources as individual properties rather than a set, and determined that the requirement to identify these historic properties through surveys conducted prior to seafloor disturbance and avoid them during development activities mitigates any possible impact. If Lease Sale 244 takes place, after the lease sale, there will be requirements to perform geohazard and archaeological surveys of the seabed and sub-seabed. These surveys are performed to identify shipwrecks or other archaeological resources discernable on the surface or buried in subsurface matrixes. They are performed prior to exploration, during exploration, and during development phases, and include geotechnical and geological (G&G) borings and acoustic remote sensing data. These surveys, combined with archaeological analysis of G&G survey cores as well as interpretation of acoustic remote sensing data have been accepted by the State Historic Preservation Officer elsewhere to satisfy the National Historic Preservation Act (as amended through 2014 and codified in Title 54 of the United States Code) “Sec. 106.” Consultation with the State Historic Preservation Officer will occur before and after each seismic survey. Seismic surveys will also be preceded by an Environmental Analysis. Thus, if previously unidentified archaeological resources or shipwrecks are identified, there will be sufficient time to mitigate and monitor them, or completely avoid effects on historic properties.

Issue 28. Description of the Physical Environment

Summary of Comments

BOEM received several comments regarding the description of the physical environment. Some comments suggested text changes were necessary to clarify or correct information in regards to Alaska Ocean Observing System (AOOS), bathymetry, benthic or intertidal habitat based on the height of the tide, salinities, rip tides or sea ice. One comment suggested an additional citation.

Source of Comments

- Citizen Advisory Councils

Response to Comments

Where appropriate, BOEM revised the Final EIS in response to requests for clarification, added citations, and similar issues. These revisions constitute BOEM's response to those comments.

The data used to describe Cook Inlet meteorology was accessed via the National Centers for Environmental Information (NCEI) formally the National Climatic Data Center (NCDC). The NCEI/NCDC assimilates, applies quality controls, tabulates and hosts the most comprehensive oceanic, atmospheric and geophysical data in the world including over 130 weather stations across the State of Alaska. Most, if not all of the historical data found at AOOS is also available from NCEI/NCDC. The near real-time meteorological data available from AOOS, while valuable, is less relevant than the historical meteorological data used for the description of the climate and meteorology of Cook Inlet.

The discussion of the amount of area between mean low water and mean high water was based on an analysis of the smooth sheet bathymetry and is not strictly correlated to the amount of benthic habitat. Further, the Final EIS states that the shallows can contain up to one-quarter (25%) of Cook Inlet's surface area. The analysis of the impacts of oil spills on benthic habitat is discussed in Section 4.3.4.6.

The Final EIS references and discusses Johnson (2008) in Section 3.1.3.6. Cook Inlet Rip Tides.

Issue 29. Submarine Infrastructure

Summary of Comments

One commenter raised considerations specific to BOEM's analysis of submarine infrastructure in Cook Inlet. Some specific suggestions or criticisms included:

- The Draft EIS underestimated and overlooked potential impacts of damage to submarine cables, and potential impeded access for maintenance resulting from OCS development.
- BOEM failed to account for an important submarine cable traversing the proposed lease area, and incorrectly combines its analysis of submarine cables with oil and gas infrastructure.
- BOEM should adopt program-wide procedures for coordination between OCS activities submarine cable systems.

Source of Comments

- Industry Non-Governmental Organizations

Response to Comments

Submarine cable infrastructure is discussed in Section 5.1.2.7 and in Table 5.1.2-1. At the exploration or development and production stage, additional procedures will be used if exploration or development proceeds, to prevent conflict between OCS activities and submarine infrastructure. Prior to any actual activities on a Cook Inlet OCS lease, the lessee (operator) will be required to conduct and submit a geohazard site survey in the proposed exploration and/or development area. The purpose of this survey will be to identify any subsea environmental hazards (i.e. natural or man-made hazards including submarine cables, sunken vessels, pipelines, etc.) on the ocean bottom that may interfere with the proposed location of the offshore well or anchoring of support vessels, which will also protect submarine infrastructure from damage or impeded access from OCS activities. The geohazard survey will be part of the required documentation to accompany the exploration plan submitted by the lessee prior to any drilling activities. In addition, a geohazard survey would also be required for other proposed subsea construction activities in the Cook Inlet lease area such as a new subsea pipeline route or other supporting infrastructure. Comments on program-wide procedures for coordination between OCS activities submarine cable systems are beyond the scope of the current analysis.

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Appendix F – Section 2

Public Hearing Transcripts

Anchorage
Kenai
Homer

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ALASKA OUTER CONTINENTAL SHELF
DRAFT ENVIRONMENTAL IMPACT STATEMENT
PROPOSED COOK INLET LEASE SALE 244
PUBLIC HEARING
Anchorage, Alaska

Taken August 15, 2016
Commencing at 5:00 p.m.

Pages 1 - 39, inclusive

Taken at
Dena'ina Center
Tikahtnu Room D
600 West 7th Avenue
Anchorage, Alaska

Reported by:
Mary A. Vavrik, RMR

2

A-P-P-E-A-R-A-N-C-E-S

For Bureau of Ocean Energy Management:

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Regional Supervisor
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BE IT KNOWN that the aforementioned proceedings were taken at the time and place duly noted on the title page, before Mary A. Vavrik, Registered Merit Reporter and Notary Public within and for the State of Alaska.

3

P-R-O-C-E-E-D-I-N-G-S

MR. MARK STORZER: Good evening. We will go ahead and get started. Glad to see everybody is here. Hopefully you are here -- and can you hear me okay? I don't like microphones because I like to be able to move around, but I guess I'll have to stay here. Hopefully you are here for the public hearing on the Cook Inlet EIS for the proposed Lease Sale 244. If you are not, you are not in the right place.

Very glad you could make it tonight. I'm Mark Storzer. I'm the Regional Supervisor for the Office of Environment with the Bureau of Ocean Energy Management, and I'll be kind of running the hearing tonight. And I just wanted to let everybody know that this hearing tonight is a very important part of the process, the leasing process, because it's your opportunity to provide testimony to us to make sure we get the information all correct in the Draft Environmental Impact Statement. And that's really what the hearing is focused on this evening is the Draft Environmental Impact Statement.

So I'd like to remind everybody that the Draft Environmental Impact Statement is not a decision document. It's a document that's used to inform the decision. And eventually a decision will be made on whether or not to have a lease sale, and that decision will eventually be

4

made by the Secretary of Interior. But this document is critical to informing that decision. So again, at this point in the process, we have not made a decision on whether or not to hold the sale. At this point we are still just developing the Draft Environmental Impact Statement, and we will use the input we get tonight and during the comment period to help inform the document and create the Final Environmental Impact Statement.

So what I'd like to remind everybody is this is a hearing tonight. And the reason we like to do that is that way we get a transcript. And Mary is the court reporter and will go ahead and record your testimony. And that testimony will actually be part of the Environmental Impact Statement. So it will be right in the record so everybody can see what testimony was provided and what was said. So it is a very important process. And we like to do that so we have that record and there is never any question, then, about did we capture the comment correctly or anything because it is all part of the record. So we are very glad that you are here tonight.

So for tonight, the plan will be, we have a short presentation to show. It's about 12 minutes or so. It gives a little overview of the EIS. So we will go ahead and show that presentation. And after that's over, we will take a few minutes. And I think if you wanted to

5

testify tonight, it's important that you signed in and got a ticket. So if there is anybody who hasn't signed in who wants to participate and testify, after the presentation is over you can go to the sign-in desk, go ahead and get signed in and get a ticket because what we will do tonight after the presentation, we will actually draw numbers so we randomly select who gets to testify first. And everybody will get five minutes to provide their testimony.

And if -- when we get through that, if we are done and we still have time, if you want an additional five minutes, we can go ahead and do that. And we will do that process until about 7:45 or so because we have to be out of the room by 8:00. So that's -- that's one way that we are here to capture your testimony tonight is actually provide public testimony.

When we are all done with the public testimony -- because I know some people don't like to speak in public. If you do -- if you still want to provide testimony, let us know and we can sit down, we can have you sit by Mary here for five minutes and give your testimony directly to her so you don't have to do it publicly if you are uncomfortable with that.

We also have two computers in the back by Michael there that if you want to enter comments, you can go ahead and do that back there, too. And that's -- you would be entering those right on regs.gov. So that's another way you can do -- provide information tonight. Or any time if you want to log onto regs.gov, you can provide comments that way between now and September 6 when the public comment period closes. So obviously there is a few different ways you can provide information to us or any combination of those. Just because you provide testimony tonight doesn't mean you can't provide comments on regs.gov or any other way that you want to between now and the end of the closing comment period.

So we will go ahead -- have I covered anything -- when you go ahead and testify, when you come up to testify, like I said, we will be drawing numbers. If you state your name clearly and spell it for Mary, that would be great. And then if you have notes or anything that you are testifying from, you can certainly leave those with Mary to make sure she captures everything in the record. So are there any questions or anything that I missed from anybody? Anything, Sharon?

MS. SHARON RANDALL: Michelle will be helping people keep track of their time.

MR. MARK STORZER: Like I said, we give everybody five minutes initially, and that's just to make sure everybody gets time. Michelle right up here will be

timing. At two minutes she will hold up a sign, let you know you have got two minutes, a minute, and then we will let you know when your five minutes is up. Again, if we get through everybody and you want to provide more testimony, we will go ahead and give you another five minutes after we are through with everybody the first time.

So if there aren't any other questions or anything that I missed, we will go ahead and just start the presentation, if I can start it. It's at full volume right now, so hopefully everybody will be able to hear.

(PowerPoint presentation:)

Welcome to the public hearing for Lease Sale 244 in the Cook Inlet. This presentation, as well as a summary handout available in the hearing, will provide you with information on the Draft Environmental Impact Statement, or EIS, for the proposed Lease Sale 244. It will also cover how to submit comments and what types of comments are most helpful in developing the final EIS.

The Bureau of Ocean Energy Management, BOEM, is a bureau of the U.S. Department of the Interior, and it's the federal agency responsible for managing orderly development of both the energy and mineral resources on the Outer Continental Shelf, or OCS, in an environmentally and economically responsible way. BOEM is the lead agency

and has worked closely with the National Park Service as a cooperating agency on the preparation of the draft EIS.

BOEM is proposing to conduct the Cook Inlet oil and gas Lease Sale 244 in June 2017 and is preparing an EIS to address potential environmental impacts resulting from typical lease sale activities. This public hearing is being held in order to receive input on the draft EIS so that we may incorporate your comments into the final EIS.

The proposed lease sale is located in the northern portion of the Cook Inlet planning area and includes 224 blocks, each block being approximately three miles by three miles square. In total, the proposed lease sale area covers approximately 1.09 million acres, or about 20 percent of the Cook Inlet planning area.

We used a targeted leasing approach to define the proposed sale area. Targeted leasing identifies areas considered for leasing that have high resource potential and clear indications of industry interest, while weighing environmental protection and subsistence use needs. The overall goal is to focus oil and gas leasing on the most promising blocks, while still protecting important habitats and critical subsistence activities.

As a result of this approach, the proposed lease sale was limited to only 20 percent of the Cook Inlet planning area, and it excludes most of the subsistence use areas

for the Alaska Native villages of Nanwalek, Seldovia and Port Graham. It focuses on areas closer to existing infrastructure needed to support exploration activities and on areas adjacent to active State leases.

It avoids the vast majority of the designated critical habitat for beluga whales and northern sea otters. It completely avoids the critical habitat for the stellar sea lion, and it reduces effects to several national parks, preserves and wildlife refuges, including Katmai National Park and Preserve, Kodiak National Wildlife Refuge, Alaska Peninsula National Wildlife Refuge, Becharof National Wildlife Refuge, and the Alaska Maritime National Wildlife Refuge.

Once the sale area was defined, we published a Notice of Intent to prepare an Environmental Impact Statement which began the public scoping period. Between October 23rd and December 8th, 2014, we accepted comments on the proposed lease sale, both online and at five public meetings held in Kenai, Homer, Seldovia, Nanwalek and Anchorage.

The comments received during the scoping period identified several issues and concerns, including the potential impact to subsistence uses and to commercial and sport fisheries, the effects on critical habitat for beluga whales and northern sea otters, the effects of drilling fluids and cutting discharges, and the effects on local communities of a potential oil spill in Cook Inlet. All of these issues and concerns gathered during the scoping process were used to develop the alternatives and mitigation measures analyzed in the draft EIS.

The draft EIS identifies six alternatives, two of which were further subdivided. So there are a total of nine alternatives evaluated in detail: Alternative 1, the proposed action; Alternative 2, the no action alternative; Alternative 3A, the beluga whale critical habitat exclusion alternative; Alternative 3B, beluga whale critical habitat mitigation alternative; Alternative 3C, the beluga whale nearshore feeding areas mitigation; Alternative 4A, the northern sea otter critical habitat exclusion alternative; Alternative 4B, the northern sea otter critical habitat mitigation alternative; Alternative 5, the gillnet fishery mitigation alternative; and Alternative 6, the prohibition of drilling discharges alternative.

Alternative 1, the proposed action, offers for lease all of the 224 blocks in the northern portion of the Cook Inlet planning area. Alternative 2, the no action alternative, would result in no lease sale being held in June 2017.

Alternatives 3A, 3B and 3C were developed to address

concerns about potential impacts to the endangered Cook Inlet distinct population segments of beluga whales. Alternative 3A, the beluga whale critical habitat exclusion alternative, would offer 214 blocks for lease, but would completely exclude from leasing the ten blocks highlighted on this map in purple that overlap the beluga whale critical habitat at the northern end of the proposed lease sale area.

Alternative 3B, the beluga whale critical habitat mitigation alternative, would offer all 224 blocks for lease; however, lessees would not be allowed to conduct marine or geohazard seismic surveys or exploration drilling in the ten lease blocks highlighted on this map in purple that overlap the beluga whale critical habitat during the five months from November 1st through April 1st of each year when beluga whales would most likely be in the area.

Alternative 3C, the beluga whale nearshore feeding areas mitigation alternative, would offer all 224 blocks for lease. However, lessees would not be allowed to conduct marine seismic surveys from November 1st through April 1st of each year when beluga whales would most likely be in the area. Additionally, lessees would not be allowed to conduct marine seismic surveys between July 1st and September 30th on the 146 blocks highlighted on this

map in aqua located wholly or partially within ten miles of major anadromous streams where belugas are likely to be migrating from their summer feeding areas.

Alternatives 4A and 4B were both developed to address concerns about potential impacts to the critical habitat of the threatened northern sea otter. Alternative 4A, the northern sea otter critical habitat exclusion alternative, would offer 217 blocks for lease but would completely exclude from leasing the seven blocks highlighted on this map in aqua that overlap with the northern sea otter critical habitat.

Alternative 4B, the northern sea otter critical habitat mitigation alternative, would offer all 224 blocks for lease while prohibiting lessees from discharging drilling fluids and cuttings and conducting sea floor disturbing activities, such as anchoring and placement of bottom-founded structures within 1,000 meters of areas designated as northern sea otter critical habitat highlighted on this map in aqua.

Alternative 5, the gillnet fishery mitigation alternative, was developed to address concerns regarding the Cook Inlet gillnet fishery. This alternative would offer all 224 blocks for lease, but lessees would be prohibited from conducting seismic surveys on the 117 full or partial blocks north of Anchor Point during the drift

gillnetting season as designated by the Alaska Department of Fish & Game. Typically the drift gillnetting season runs from mid June to mid August.

In addition, lessees would be advised of when the fishery operates and would be required to notify the local drift gillnet fishing organization of any temporary or permanent structures planned during the season.

Alternative 6, the prohibition of drilling discharges alternative, was developed to address concerns regarding potential impacts of discharging drilling fluids and cuttings from exploration into Cook Inlet. Under this alternative, all 224 blocks would be offered for lease. However, the discharge of all drilling fluids and cuttings into Cook Inlet from exploration would be prohibited.

There are four levels of impacts described in the draft EIS: Negligible, minor, moderate and major. These levels take into account the context and intensity of the impact based on four parameters: Detectability, duration, spatial extent and magnitude. We use the best available information and science along with professional judgment to determine the level of impact from negligible to major. Impacts that fall in the category of major are considered to be significant under the National Environmental Policy Act. It should be noted that for biological resources, impacts are determined based on changes to the entire

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14

stock or population rather than on an individual.

The impact analysis for each resource and alternative is fully described in chapter 4 of the draft EIS.

The notice of availability for the Draft Environmental Impact Statement was published on July 22, 2016, beginning a 45-day public comment period which will remain open through September 6, 2016. We will use the comments received during this period to revise the draft EIS as needed and may release the Final Environmental Impact Statement and Record of Decision in early 2017. The Cook Inlet Lease Sale 244, if approved, will be held in June 2017.

There are several ways to provide comments on the Draft Environmental Impact Statement. You may provide testimony at this hearing either publicly or individually. Additionally, you may visit www.regulations.gov to submit your comments online. You may do this on your own, or if you choose to submit online comments tonight, you may visit one of our computer stations to do so. Search for Docket No. BOEM-2014-0001. The entire draft EIS, as well as other information regarding the proposed lease sale, would be found on BOEM's website at www.boem.gov/ak244/. Or you may request a CD copy from our staff at this hearing.

Your comments and testimony here tonight will help us

MIDNIGHT SUN COURT REPORTERS (907) 258-7100

15

improve the information disclosed in the EIS and provide a clear basis for choice between alternatives. It is important to remember that EISs are not decision documents. Ultimately the Secretary of the Interior will make the final decision whether to hold, modify or cancel the lease sale and may choose one or any combination of alternatives in that decision.

Certain types of comments are especially helpful in ensuring we use the most accurate and sound information in finalizing the EIS. Merely providing comments such as, I'm in favor of the project, or I oppose the project, are not very informative. You can help us improve the document and make sure we are using the best possible information by letting us know if the draft EIS has considered all of the habitats, species, places and activities that may be affected by oil and gas leasing; if not, what is missing; whether the draft EIS characterizes the potential impacts well; why, or why not; if there are any impacts you are concerned about that are not discussed in the document; what are they; whether there are any additional mitigation measures BOEM should consider to reduce impacts; what are they; or if there is anything else you feel BOEM should know to help us fully assess the potential impacts from oil and gas leasing in Cook Inlet waters.

MIDNIGHT SUN COURT REPORTERS (907) 258-7100

16

Thank you for coming this evening and sharing your thoughts on the draft EIS for the proposed oil and gas lease sale in Cook Inlet with us.

(End of PowerPoint presentation.)

MR. MARK STORZER: Okay. We will just break just for a few minutes here. If there is anybody who wants to provide testimony who hasn't signed in, go ahead and sign in. And I also failed to mention earlier that if anybody came in and wanted to see the full PowerPoint, we do have it on a laptop back in the back where Gwen is, so if you want to see the full presentation, you can go ahead and sit back there and watch it where Gwen is on her computer.

So in about five minutes we will go ahead and draw the first number and start the testimony.

(A break was taken.)

MR. MARK STORZER: All right. I think everybody is back, and I hope everybody signed up. We will go ahead, and what we will do is I'll have somebody draw the first -- we will draw two numbers to begin with so we have the first two speakers lined up. What I'll do is I'll have somebody draw the first number. All right. The first number is just the last two on your ticket. 37. 37. Lucky 37. You can go ahead and draw another number out of here for the next -- all right. The next number,

MIDNIGHT SUN COURT REPORTERS (907) 258-7100

17

36. Go ahead. Right there. The mike is on so, again, state your name, spell your name for Mary so she can get it right.

MR. CARL PORTMAN: Good evening. My name caller is Carl Portman. I'm deputy director of the Resource Development Council for Alaska. RDC is an Alaska business association comprised of individuals and companies from Alaska's oil and gas, mining, fishing, tourism and forestry industries. Our membership also includes Alaska Native Regional Corporations, local communities, organized labor, and industry support firms.

Our purpose is to expand the state's economic base through the responsible development of our natural resources.

RDC supports the proposed Lease Sale 244 in Cook Inlet. The proposed sale is clearly in the best interest of Alaska and its residents. The discovery of oil in the Cook Inlet region led to Alaska's statehood and has remained a vital resource for energy security for local residents. Federal waters in Cook Inlet offer potential for new natural gas reserves to meet future demand. Approximately 85 percent of the electricity generated in Southcentral Alaska relies on natural gas-fired turbines, and approximately 60 percent of Alaskans rely on Cook Inlet natural gas as a source of heat or electricity for their homes and businesses.

Lease Sale 244 offers new opportunities for economic development and diversification along the southern reaches of the Kenai Peninsula. New oil and gas production would create hundreds of new direct and indirect jobs and boost tax revenues to local government. The oil and gas industry is a major component of the Southcentral Alaska economy, sustaining thousands of jobs and significant revenues which help fund local government services and programs.

Oil and gas development and production has coexisted with other industries, including fishing and tourism, for more than 50 years in Cook Inlet. Alaska has shown that oil and gas -- that oil and gas development and environmental protection are not mutually exclusive. The industry's record clearly indicates it has the knowledge, experience and expertise to avoid impacts to sensitive areas. Spill prevention and response capabilities are a major part of the industry plans and operations to protect sensitive areas and the rich fisheries of Cook Inlet.

Although interest in exploration and development in Cook Inlet may be limited at this time, RDC urges the Bureau of Ocean Energy Management to proceed with Lease Sale 244. While industry investment has slowed due to low oil prices -- low oil and gas prices, no one can

accurately predict what the price of oil or gas will be in a year from now or beyond. If there is no interest when the lease sale occurs, the federal government does not -- does have the option to cancel the sale. In the meantime, we encourage BOEM to allow market dynamics to decide the fate of a future lease sale.

Clearly, the proposed lease sale is in the best interest of the region, Alaska and the nation. Moreover, a 2014 poll found that 73 percent of Alaskans support offshore development in the Alaska OCS, including Cook Inlet.

Thank you for the opportunity to present these preliminary comments. And we will modify them and send them -- send in our final comments before the September 6th deadline.

MR. MARK STORZER: All right. No. 36. I'll go ahead and have you draw the next number. All right No. 40 will be next. 40.

MS. SARAH STEVENS: Hi. My name is Sarah Stevens, with an H and a V. I've never done anything like this before, so I'm super nervous. You will have to excuse me. Like I said, my name is Sarah Stevens, and I have a son and a husband who are part of the Anchorage School District, and we have a vested interest in making sure that Cook Inlet is an environmentally

sustainable place.

One thing that I noticed during the presentation is that the draft EIS statement does not take into account global climate change or the recent Paris agreement that our country has entered into.

I saw an article today by Bill McKibben, who is the founder of 350.org, and the title of the article is A World at War. We are under attack from climate change, and our only hope is to mobilize like we did in World War II. From the article he says, with each passing week, another 22,000 square miles of Arctic ice disappears. At an insurance industry conference in April, a federal official described the new data as an OMG thing. The long-term effect, the New York Times reported, would likely be down -- would be to drown the world's coastlines, including many of its great cities. One of those cities is Anchorage. So I think it's very important that we take that into account.

I am also very concerned about the truthfulness of the oil industry. According to The Guardian two members of Congress recently wrote to our Attorney General because they were, "concerned by the results of two separate investigations which found that Exxon-Mobil scientists confirmed fossil fuels were causing climate change decades ago, but they publicly embarked on a campaign of denial."

The Guardian also reports that the oil company scientists knew that fossil fuels caused climate change as early as 1981. This was 27 years before climate change became a public issue. So I'm very concerned about listening to anything that the oil and gas industry has to say.

Alaska is ground zero for climate change and its impacts, as we all know. According to the World Wildlife Fund, the colder the water, the more quickly it absorbs carbon dioxide gas, so it's also more acidic. They also say that a recent study calculates that the northern ocean will be the first in the world to hit the point of no return with dangerous systemic acidification. By the end of this decade, 10 percent of the Arctic will be so acidic that it will damage rather than foster life.

Communities -- according to Alaska's own -- Alaska's own Adaptation Advisory Group of the governor's subcabinet on climate change, impacts of climate change include the fisheries Alaskans rely on. Communities' and industries' reliance on marine-based fisheries will be particularly affected, as will individuals and communities dependent on subsistence harvests of marine fish and wildlife as essential elements of their food supply and cultural well-being.

According to the Paris agreement that we have entered into as a nation, we are supposed to "pursue efforts to

MIDNIGHT SUN COURT REPORTERS (907) 258-7100

22

limit the temperature increase to 1.5 degrees Celsius above preindustrial levels." How are we going to do that? Well, we have to have solutions. Fortunately, there are lots of solutions.

There is a website called thesolutionsproject.org, and from their website they say, policy change and stronger relationships at the state level are key to ensuring all people can access the jobs, household budget, and health benefits of clean energy and efficiency. And from the Renewable Energy Alaska Project's 2012 report on tidal power, waves and tidal currents off Alaska's coastline would generate more than 850 terawatt hours of electrical energy annually if fully developed. Much of that potential lies untapped in the waters of the Cook Inlet region specifically.

Although much of the wave power in Alaska occurs in places that are not easy to access, according to The Solutions Project, we would only need wave power to create 1 to 2 percent of total renewable energy output for the state. Their plan would also create 14,662, 40-year construction jobs.

My last thing I just want to say is to the Secretary of the Interior, I would highly and strongly urge you to choose Alternative 2 because we can no longer as a state or as a nation afford to continue developing dirty fossil

MIDNIGHT SUN COURT REPORTERS (907) 258-7100

23

fuel energy.

Thank you.

MR. MARK STORZER: 41 will be next. And again, when we are done, if people want to provide more, we can give an additional five minutes to anybody who wants to.

MR. JEREMY PRICE: My name is Jeremy Price. I am the Alaska State Director of a group called Americans For Prosperity, but I'm here as a concerned citizen. I'm a third-generation Alaskan. My grandfather started a homestead back in the mid 1950s. We have lived there ever since. And I stand in support of Cook Inlet Lease Sale 244. And I agree with the proposed action.

But I think what's missing from this EIS is the human story. After I'm done giving my remarks, I'm going to get in my truck. I'm going to go drive to South Anchorage. We have got a house there. And on the way, I'm going to pass a lot of signs. And those signs are going to say "for sale." And I'm going to go look at a house that's undervalued. It's a good time to buy. And the reason it's undervalued is because the economy is going down, and the economy is going down because oil prices have dropped and the industry is downsizing, cutting workforce. People are leaving the state. And I wonder what the future of the state is going to look like.

MIDNIGHT SUN COURT REPORTERS (907) 258-7100

24

We are a resource development state, folks. We are a resource development state. Our economy is absolutely dependent on it. The production and the operations that have gone on in Cook Inlet has gone on for decades, and the industry has coexisted with other industries, with other stakeholders, with other users of the system. And that will continue in the future. We can do this safely. We together can provide a better future for our state if this agency and this Administration allows production to occur in a responsible manner.

I think that what's important here is to allow the market to work, let the market determine if there is interest, and let the industry determine if they have the viability to operate under these economic conditions.

If the lease sale is canceled, we are going to continue to see a chill in investment. We will see a drop in employment. We will see the economy continue to go down. We will see people continue to leave the state. The best thing that this agency and this Administration can do for Alaska right now is allow us to develop our resources. I plead with this Administration to not turn us into West Virginia.

Thanks for your time.

MR. MARK STORZER: Who is lucky No. 41? No. 38.

MIDNIGHT SUN COURT REPORTERS (907) 258-7100

25

MR. DUNE LANKARD: Good afternoon. My name is Dune Lankard. I'm an Eyak Indian from Cordova, Alaska. I'm a fisherman, conservationist, and I am also the Alaska representative for the Center for Biological Diversity. And I think that this Cook Inlet oil lease, oil and gas lease sale, is wrong. I think that, you know, we are all entitled to our opinions and feelings about certain things, but the environment and our way of life has to be first and foremost.

And being a recovering victim of the Exxon Valdez oil spill that has yet to recover, I know that more oil development is not the answer. Back then when I used to fish nine months out of the year, herring was 50 percent of our annual income. And we haven't fished herring but maybe two, maybe three years since the Exxon Valdez 27 years ago. And our wild stock salmon have yet to recover. This is one of the worst recorded runs in history for all species of salmon. I think the only place in Alaska that has hit -- has had any volume of fish has been over in Bristol Bay. And they are declaring a lot of fisheries, you know, a disaster. And you know, I think on a subsistence level, that the tribes should be opposing this. All the fishermen should be outraged.

Any more development -- when oil spills happen, you can't clean them up. Once that oil hits the water, the war is over. There is nothing you can do. And the oil companies will fight. Exxon appealed 17 times and -- until they got the Supremes that they wanted. And they didn't take the case to set a precedent to protect people or see that justice was served. They wanted to make sure that a precedent was set for punitive damage awards so they would be limited, so they would be two to one. So the final settlement that we did receive after 20-some years of fighting in court was equivalent of one good day of fishing and a lost way of life.

And so I think with the endangered beluga whales out there and being an endangered species myself as a fisherman, that we should be looking at renewable and other ways to create a sustainable and a thriving economy that isn't based on destroying the environment so we can survive another 10 or 20 years. It's not worth it.

The thing about salmon is it's a renewable economy. It's a renewable resource. And as long as we protect that habitat and those oceans, then we will always be able to make a way of life out there on the land and the sea for subsistence and commercial fishing purposes.

And so when I hear about some of these ideas and more drilling and more development and oil company and industry is compatible with the fishing industry, those are all lies. It doesn't work. We are living proof. Come down

to Cordova. Come down to Prince William Sound. There are still places that will never come to life again. And if they do, it's probably not going to be in my lifetime. And now that I have a six-year-old daughter, Ananda, I want to see that Alaska figures out how to develop its resources sustainably and so it protects the thriving livelihood of some of the people that are feeding literally millions and millions of people around the world.

And so when that spill happened I thought, you know, everyone was going to come in and they would help clean it up and make everything better and the government would stand up for us and the courts would stand up for us. Nobody ever came, and there was never any settlement. So why should we trust or believe anything that the oil industry says? Because it's all untrue. No one is coming. No one is going to help us. So who makes a difference is us, the people who finally decide to stand up and say we have had enough. And I can tell you right now we need to figure out how to keep it in the ground and take care of our way of life because this is uncomparable to none. No other place like this exists.

And so as the climate is warming -- yeah, the climate is warming and things are changing, people are going to be coming here. And there is has got to be something here

for them. Thank you.

MR. MARK STORZER: 39.

MS. SUZANNE SCHAFER: I'm not crying. This is a strong moment for all of us. I'm Suzanne Schafer. I'm a mother, a participant in the audience. I hear speaking of the Exxon oil spill still. 23 years ago I was writing a college research paper about how devastating that oil spill was. It's incredibly beyond my comprehension that it's still a devastation and that we are facing those devastations as potentials, and we keep saying we can prevent. We have preventative measures. We can prevent what happened in the Gulf. Sure. We did it.

I think not.

The interesting predicament I find myself 23 years later after being in school is, having been a returned student and gotten my environmental studies degree, I'm a mother, I'm way more impassioned than I was even just as a college student caring about humanity and the environment and the living world that we are so lucky to have every day.

I work with an organization called Moms Clean Air Force. It's a nationwide organization, and we are 800,000 members strong, and they feel it's important that they have a voice from Anchorage to talk about pollution, to talk about oil and gas, to talk about methane emissions,

but mainly to talk about our children's future.

Thank you, mother from the audience. I know how nervous you are. I have a card for you. Okay. We are going to talk.

I'm here to just testify and to just stand up and say there are other solutions to these issues. We are wasting time; very, very valuable right now. We are wasting money. We are wasting our amazing energetic and intellectual capacity on what we have been doing for how many generations did the gentleman that thinks we should keep doing this for?

We have such a bright future, I believe, for our children. And it's because people are participating in this very honor that we have, this democracy that our voice can be heard from everywhere. Thank you for speaking up on the -- on behalf of fishermen and all the resources that are abundant and rich and beautiful right here in Cook Inlet that deserve to continue and prosper.

So I guess what I'm asking for is that the -- that there be a no action. That the plan 2 seems to be -- seems to be the most viable at this point in time. There seems to be lease that are in the area that are absolutely stagnant. I think oil and gas industry, yes, is stagnant. And even if it were to pick up, do you think that it's really worth it to keep polluting our environment, to keep

MIDNIGHT SUN COURT REPORTERS (907) 258-7100

30

killing off our renewable resources and to keep killing our children and to kill future generations of prosperity? I don't think it's worth it.

I think we need to take our energies and move forward. We do have abundant resources that are renewable here in Alaska, a lot of potential. We have the lack of infrastructure so it would be okay to implement, and we don't have to tear down existing infrastructures. There are ways to move forward besides allowing more oil and gas exploration in the Cook Inlet. And I challenge society to do so. Thank you.

MS. LAURA COMER: Hi. My name is Laura Comer, L-A-U-R-A C-O-M-E-R. I'm with the Sierra Club chapter here in Alaska. The Sierra Club is a national nonprofit organization with 64 chapters and over 630,000 members dedicated to exploring, enjoying and protecting the wild places of the earth, especially here in Alaska.

We work on practicing and promoting the responsible use of our ecosystems and resources, educating and enlisting humanity to protect and restore the quality of the natural and human environmental using all lawful means to carry out these objectives.

Our interests encompass a wide range of environmental issues, including wildlife conservation, wilderness, public lands, and water protection, as well as many

MIDNIGHT SUN COURT REPORTERS (907) 258-7100

31

others.

What I care about most personal in regards to this lease sale is the lack of climate impact looked at in this mitigation plan and through the different alternatives suggested. The Alaska chapter of the Sierra Club has over 1,450 members here in this state. We are led by all volunteer groups whose members work to protect and preserve Alaska's resources and people and communities that depend on them. We have a unique landscape. We have unique communities and wildlife resources that are top issues for many members.

Federal law clearly states that the agency is required to analyze the impacts that dirty, dangerous offshore drilling will have on these ecosystems that our members cherish, these coastal communities and our climate. The federal law requires that they look at these impacts before deciding whether to allow them, not the other way around. This agency's backwards approach reflects the fundamental misunderstanding of the legal obligations and an apparent desire to appease the oil industry at the expense of our ocean, environment and peoples.

I'm going to be touching on the environment, human rights, and economic impacts that this EIS fails to address.

MIDNIGHT SUN COURT REPORTERS (907) 258-7100

32

So first thing is really the climate impacts that we are seeing here. This failure to consider or disclose global impacts from consuming the oil and gas extracted under this proposal is morally and legally unjustifiable. This project is inconsistent with global agreements such as the Paris agreements that we have to limit global warming to one and a half or even two degrees Celsius. These impacts that are already being felt by Alaskans by the melting permafrost, by the rise in sea levels that we are seeing firsthand here in this state.

And on a more local level, too, like Cook Inlet belugas. Only a couple of these alternatives propose even looking at mitigation where we have to pick beluga whales over the otters over gillnet fisheries. It should never be a choice of one resource over the other. Belugas already face a barrage of human-caused hazards threatening their survival. Continued oil drilling is not an option.

And on the human side, oil spills, air pollution from the drilling and these facilities make people sick. There is well documented standards that often when these proposals are happening, offshore measures are not met. We see the impacts moving on shore. We see the impacts from the refineries. We see the impacts from the drilling. We see the impacts from when this is transported and the potential spills and what it will have

MIDNIGHT SUN COURT REPORTERS (907) 258-7100

33

on the local communities, as well as people around the world through climate change.

Offering new offshore oil and gas leases puts our oceans and coastal communities at risk of spills and other damages. As Dune said, Prince William Sound is still reeling from these damages. New offshore oil development increases the risk of even more accidents and spills. And economically this simply doesn't make sense. If the price of oil is low, simple Economics 101, supply and demand, doesn't say then you drill more oil. That will only keep the price low. The oil companies already have enough currently identified fossil fuel resources to last for decades, more than enough to get through the immediate transition to clean renewable energy.

Drilling in federal waters around Alaska is expensive, difficult and dangerous. Previous auctions in Cook Inlet have been canceled because of lack of industry interest, so moving forward with the sale with the risks as I presented makes no sense.

I'd like to see BOEM adopt the EIS no action alternative and cancel this last lease sale under current offshore oil and gas leasing program. This action is necessary to protect our peoples, our climate, our community, and our way of life here in Alaska.

Thank you.

MR. MARK STORZER: Thanks to everyone that testified. Is there anybody that would like to testify or that came in or would like to testify for another five minutes? We have anybody, Bridget, sign in or anything?

MS. BRIDGET PSARIANOS: No, no new people.

MR. MARK STORZER: And again, if you want to talk to Mary one-on-one, you can certainly do that if there is any interest in doing that. Otherwise, we will be here for a while, a little bit longer to see if anybody else comes in. But I appreciate everybody coming tonight.

MR. DUNE LANKARD: Can we talk about solutions a little bit and alternatives?

MR. MARK STORZER: You can talk -- I mean, the point of this is to get the feedback from you to not, you know, have -- because we don't have any answers or anything for you, but we are here. We can talk to you, you know, if you have specific things you would like to talk about but, again, the testimony is what we are really after tonight on the draft EIS. It's very helpful to hear the wide range of concerns out there.

If nobody wants an additional five minutes or so to testify, we will go ahead and close this hearing.

(A break was taken.)

MR. MARK STORZER: We have a couple folks that want to testify, so we will open the record back up,

and each person will have five minutes to testify. So we will go ahead. And please state your name and spell it for Mary so she can get it for the record. And we will go ahead. Michelle will be keeping track of the time. You will get five minutes to testify. So she will let you know.

MS. SU CHON: Hi. My name is Su Chon, S-U C-H-O-N. I think we all know here that climate change is a real thing that's happening. It's -- there is undeniable evidence of it. So I am concerned why we aren't using our resources to transition into cleaner energy rather than trying to extract the last of the very decreasing profits of oil and gas. This draft environmental statement is a little bit concerning because it doesn't even specify what minor or minor to moderate or negligible means in the impact ratings. It's very ambiguous. And I think a lot of that is very concerning, and it's just not a -- there needs to be a lot more work and detail in the Draft Environmental Impact Statement. This is not sufficient at all. Thank you.

MS. DABIN LEE: Hello. My name is Dabin Lee. I'm a student at UAA. And I also have similar concerns. I don't think that the proposal defines what is considered like minor and moderate and severe impacts on the environment. And it's also very concerning that it

doesn't address the impact of drilling on climate change at all. And like Su said, we are seeing evidence of this in melting glaciers and sea level rise as well as ocean acidification. And I believe that further drilling will just further worsen impacts on the environment and further -- and deepen the climate -- the climate crisis.

As a nursing student, it's -- it's upsetting to think about the potential oil spills and the chemical pollution that would affect not just our wildlife like our beluga whales and our sea otters and sea lions and our salmon that we hold so dear. But potential oil spills and pollution also have a real -- a very real negative health impact on people who live in the area, just like the -- the continued negative health impacts on people who are affected by the Valdez Exxon oil spill.

And I believe that the agency should adopt the no action alternative and cancel the lease sale. I believe this is necessary to not just protect the -- our climate and our oceans and our wildlife, but also our people who live here. Thank you.

MR. MARK STORZER: Okay. Thanks for your testimony. Anybody else like to testify at this time? We will just go off record in case anybody else wants to provide testimony.

(Off the record.)

(Proceedings adjourned at 7:45 p.m.)

REPORTER'S CERTIFICATE

I, MARY A. VAVRIK, RMR, Notary Public in and for the State of Alaska do hereby certify:

That the foregoing proceedings were taken before me at the time and place herein set forth; that the proceedings were reported stenographically by me and later transcribed under my direction by computer transcription; that the foregoing is a true record of the proceedings taken at that time; and that I am not a party to nor have I any interest in the outcome of the action herein contained.

IN WITNESS WHEREOF, I have hereunto subscribed my hand and affixed my seal this 25th day of August 2016.

MARY A. VAVRIK,
Registered Merit Reporter
Notary Public for Alaska

My Commission Expires: November 5, 2016

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STATE OF ALASKA
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MARY A. VAVRIK

INDEX

Public Hearing Draft EIS Cook Inlet Lease Sale 244
BOEM -- Anchorage, Alaska August 15, 2016

Public Hearing Draft EIS Cook Inlet Lease Sale 244
BOEM -- Anchorage, Alaska August 15, 2016

Public Hearing Draft EIS Cook Inlet Lease Sale 244
BOEM -- Anchorage, Alaska August 15, 2016

ALASKA OUTER CONTINENTAL SHELF
DRAFT ENVIRONMENTAL IMPACT STATEMENT
PROPOSED COOK INLET LEASE SALE 244
PUBLIC HEARING
Kenai, Alaska

Taken August 18, 2016
Commencing at 5:15 p.m.

Pages 1 - 33, inclusive

Taken at
National Guard Armory
105 South Forest Drive
Kenai, Alaska

Reported by:
Mary A. Vavrik, RMR

2

A-P-P-E-A-R-A-N-C-E-S

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Chief Environmental Analysis Section I

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3

P-R-O-C-E-E-D-I-N-G-S

MR. MARK STORZER: Good evening, folks. We will go ahead and get started just to -- appreciate everybody's time. So I'm Mark Storzer. I'm the Regional Supervisor for Office of Environment with the Bureau of Ocean Energy Management here in the Anchorage Region -- or the Alaska Region. We are out of Anchorage. Everybody here is out of Anchorage.

What we will be doing tonight is -- this is a public hearing. So we're here really to get your testimony on the Draft Environmental Impact Statement. It's always important to do hearings because that way -- we have a court reporter. So Mary will be recording testimony tonight. And that's real helpful for us in using that information we get through this process to help inform the Draft Environmental Impact Statement so we can finalize that statement. And it's really a great opportunity to give input to the process.

Whether or not you testify tonight, there is other ways you can also give input. You can go online at regs.gov to give input any time between now and September 6th when the comment period is scheduled to close. We also have a computer in the other room. If you want to go ahead and enter any comments or anything online tonight, you can do that. Just let us know.

4

But what we are really doing tonight -- so far we have one person to testify so far, so what we have tonight is we have about a 15-minute presentation that gives a little overview of the EIS as it's currently -- the draft EIS. And we will run through it and see if anybody else shows up that wants to testify.

And we normally draw numbers to see who gets to testify first and then we go through that process randomly. And we will have everybody initially start with five minutes of testimony. I don't think we are going to be overwhelmed tonight, so if you want an additional five minutes, we will go ahead and do that. And again, it's all recorded. And we are really here to get your input. So that's really the most important part of the process.

But I also like to remind folks, right now we're here about the Draft Environmental Impact Statement. At this point in the process, there has still not been any decision made on whether or not there will be a lease sale. But this document is used to help inform the decisionmaker, who in this case is the Secretary of Interior. She will ultimately -- right now it's a she -- will ultimately make the decision whether or not to have the lease sale. So right now it can still be either lease sale or no lease sale. That decision hasn't been made. And this document is just used to inform that decision

5

making.

So when you testify, like I said, we will start with five minutes and take it from there.

So we will go ahead and show the presentation. Like I said, we will take a break. Afterwards, if other people show up, we will take it -- kind of play it by ear and see how many people show up. It's such a beautiful night, it's hard to stay inside. Go ahead, Gwen, and get that started. Did I miss anything to cover?

(PowerPoint presentation:)

Welcome to the public hearing for Lease Sale 244 in the Cook Inlet. This presentation, as well as a summary handout available in the hearing, will provide you with information on the Draft Environmental Impact Statement, or EIS, for the proposed Lease Sale 244. It will also cover how to submit comments and what types of comments are most helpful in developing the final EIS.

The Bureau of Ocean Energy Management, BOEM, is a bureau of the U.S. Department of the Interior, and it's the federal agency responsible for managing orderly development of both the energy and mineral resources on the Outer Continental Shelf, or OCS, in an environmentally and economically responsible way. BOEM is the lead agency and has worked closely with the National Park Service as a cooperating agency on the preparation of the draft EIS.

MIDNIGHT SUN COURT REPORTERS (907) 258-7100

6

BOEM is proposing to conduct the Cook Inlet oil and gas Lease Sale 244 in June 2017 and is preparing an EIS to address potential environmental impacts resulting from typical lease sale activities. This public hearing is being held in order to receive input on the draft EIS so that we may incorporate your comments into the final EIS.

The proposed lease sale is located in the northern portion of the Cook Inlet planning area and includes 224 blocks, each block being approximately three miles by three miles square. In total, the proposed lease sale area covers approximately 1.09 million acres, or about 20 percent of the Cook Inlet planning area.

We used a targeted leasing approach to define the proposed sale area. Targeted leasing identifies areas considered for leasing that have high resource potential and clear indications of industry interest, while weighing environmental protection and subsistence use needs. The overall goal is to focus oil and gas leasing on the most promising blocks, while still protecting important habitats and critical subsistence activities.

As a result of this approach, the proposed lease sale was limited to only 20 percent of the Cook Inlet planning area, and it excludes most of the subsistence use areas for the Alaska Native villages of Nanwalek, Seldovia and Port Graham. It focuses on areas closer to existing

MIDNIGHT SUN COURT REPORTERS (907) 258-7100

7

infrastructure needed to support exploration activities and on areas adjacent to active State leases.

It avoids the vast majority of the designated critical habitat for beluga whales and northern sea otters. It completely avoids the critical habitat for the stellar sea lion, and it reduces effects to several national parks, preserves and wildlife refuges, including Katmai National Park and Preserve, Kodiak National Wildlife Refuge, Alaska Peninsula National Wildlife Refuge, Becharof National Wildlife Refuge, and the Alaska Maritime National Wildlife Refuge.

Once the sale area was defined, we published a Notice of Intent to prepare an Environmental Impact Statement which began the public scoping period. Between October 23rd and December 8th, 2014, we accepted comments on the proposed lease sale, both online and at five public meetings held in Kenai, Homer, Seldovia, Nanwalek and Anchorage.

The comments received during the scoping period identified several issues and concerns, including the potential impact to subsistence uses and to commercial and sport fisheries, the effects on critical habitat for beluga whales and northern sea otters, the effects of drilling fluids and cutting discharges, and the effects on local communities of a potential oil spill in Cook Inlet.

MIDNIGHT SUN COURT REPORTERS (907) 258-7100

8

All of these issues and concerns gathered during the scoping process were used to develop the alternatives and mitigation measures analyzed in the draft EIS.

The draft EIS identifies six alternatives, two of which were further subdivided. So there are a total of nine alternatives evaluated in detail: Alternative 1, the proposed action; Alternative 2, the no action alternative; Alternative 3A, the beluga whale critical habitat exclusion alternative; Alternative 3B, beluga whale critical habitat mitigation alternative; Alternative 3C, the beluga whale nearshore feeding areas mitigation; Alternative 4A, the northern sea otter critical habitat exclusion alternative; Alternative 4B, the northern sea otter critical habitat mitigation alternative; Alternative 5, the gillnet fishery mitigation alternative; and Alternative 6, the prohibition of drilling discharges alternative.

Alternative 1, the proposed action, offers for lease all of the 224 blocks in the northern portion of the Cook Inlet planning area. Alternative 2, the no action alternative, would result in no lease sale being held in June 2017.

Alternatives 3A, 3B and 3C were developed to address concerns about potential impacts to the endangered Cook Inlet distinct population segments of beluga whales.

MIDNIGHT SUN COURT REPORTERS (907) 258-7100

9

Alternative 3A, the beluga whale critical habitat exclusion alternative, would offer 214 blocks for lease, but would completely exclude from leasing the ten blocks highlighted on this map in purple that overlap the beluga whale critical habitat at the northern end of the proposed lease sale area.

Alternative 3B, the beluga whale critical habitat mitigation alternative, would offer all 224 blocks for lease; however, lessees would not be allowed to conduct marine or geohazard seismic surveys or exploration drilling in the ten lease blocks highlighted on this map in purple that overlap the beluga whale critical habitat during the five months from November 1st through April 1st of each year when beluga whales would most likely be in the area.

Alternative 3C, the beluga whale nearshore feeding areas mitigation alternative, would offer all 224 blocks for lease. However, lessees would not be allowed to conduct marine seismic surveys from November 1st through April 1st of each year when beluga whales would most likely be in the area. Additionally, lessees would not be allowed to conduct marine seismic surveys between July 1st and September 30th on the 146 blocks highlighted on this map in aqua located wholly or partially within ten miles of major anadromous streams where belugas are likely to be migrating from their summer feeding areas.

Alternatives 4A and 4B were both developed to address concerns about potential impacts to the critical habitat of the threatened northern sea otter. Alternative 4A, the northern sea otter critical habitat exclusion alternative, would offer 217 blocks for lease but would completely exclude from leasing the seven blocks highlighted on this map in aqua that overlap with the northern sea otter critical habitat.

Alternative 4B, the northern sea otter critical habitat mitigation alternative, would offer all 224 blocks for lease while prohibiting lessees from discharging drilling fluids and cuttings and conducting sea floor disturbing activities, such as anchoring and placement of bottom-founded structures within 1,000 meters of areas designated as northern sea otter critical habitat highlighted on this map in aqua.

Alternative 5, the gillnet fishery mitigation alternative, was developed to address concerns regarding the Cook Inlet gillnet fishery. This alternative would offer all 224 blocks for lease, but lessees would be prohibited from conducting seismic surveys on the 117 full or partial blocks north of Anchor Point during the drift gillnetting season as designated by the Alaska Department of Fish & Game. Typically the drift gillnetting season

runs from mid June to mid August.

In addition, lessees would be advised of when the fishery operates and would be required to notify the local drift gillnet fishing organization of any temporary or permanent structures planned during the season.

Alternative 6, the prohibition of drilling discharges alternative, was developed to address concerns regarding potential impacts of discharging drilling fluids and cuttings from exploration into Cook Inlet. Under this alternative, all 224 blocks would be offered for lease. However, the discharge of all drilling fluids and cuttings into Cook Inlet from exploration would be prohibited.

There are four levels of impacts described in the draft EIS: Negligible, minor, moderate and major. These levels take into account the context and intensity of the impact based on four parameters: Detectability, duration, spatial extent and magnitude. We use the best available information and science along with professional judgment to determine the level of impact from negligible to major. Impacts that fall in the category of major are considered to be significant under the National Environmental Policy Act. It should be noted that for biological resources, impacts are determined based on changes to the entire stock or population rather than on an individual.

The impact analysis for each resource and alternative

is fully described in chapter 4 of the draft EIS.

The notice of availability for the Draft Environmental Impact Statement was published on July 22, 2016, beginning a 45-day public comment period which will remain open through September 6, 2016. We will use the comments received during this period to revise the draft EIS as needed and may release the Final Environmental Impact Statement and Record of Decision in early 2017. The Cook Inlet Lease Sale 244, if approved, will be held in June 2017.

There are several ways to provide comments on the Draft Environmental Impact Statement. You may provide testimony at this hearing either publicly or individually. Additionally, you may visit www.regulations.gov to submit your comments online. You may do this on your own, or if you choose to submit online comments tonight, you may visit one of our computer stations to do so. Search for Docket No. BOEM-2014-0001. The entire draft EIS, as well as other information regarding the proposed lease sale, would be found on BOEM's website at www.boem.gov/ak244/. Or you may request a CD copy from our staff at this hearing.

Your comments and testimony here tonight will help us improve the information disclosed in the EIS and provide a clear basis for choice between alternatives. It is

important to remember that EISs are not decision documents. Ultimately the Secretary of the Interior will make the final decision whether to hold, modify or cancel the lease sale and may choose one or any combination of alternatives in that decision.

Certain types of comments are especially helpful in ensuring we use the most accurate and sound information in finalizing the EIS. Merely providing comments such as, I'm in favor of the project, or I oppose the project, are not very informative. You can help us improve the document and make sure we are using the best possible information by letting us know if the draft EIS has considered all of the habitats, species, places and activities that may be affected by oil and gas leasing; if not, what is missing; whether the draft EIS characterizes the potential impacts well; why, or why not; if there are any impacts you are concerned about that are not discussed in the document; what are they; whether there are any additional mitigation measures BOEM should consider to reduce impacts; what are they; or if there is anything else you feel BOEM should know to help us fully assess the potential impacts from oil and gas leasing in Cook Inlet waters.

Thank you for coming this evening and sharing your thoughts on the draft EIS for the proposed oil and gas lease sale in Cook Inlet with us.

(End of PowerPoint presentation.)

MR. MARK STORZER: All right. We have two folks signed up to testify tonight. What we have been doing is just drawing a number to see who goes first. So we can go ahead. And I'll have someone draw the -- actually, just go ahead and draw a number.

MS. SUSAN SAUPE: Is it only a testify thing, or is there a potential for any questions to clarify what we just heard?

MR. MARK STORZER: It's just testimony tonight because it's set up as a public hearing just to get the input. But if you have -- if you have questions, really the best thing to do is just shoot us a comment, what does this mean or what do you think about that, because that way it's part of the record and we can address that when we deal with it because one thing I would encourage everybody to do is, if you are interested, you can -- at any time you can go to regs.gov and you can see all the comments, the testimony and everything that's been issued so far. I mean, even as of today that's a current site that's live. So if you have questions and stuff, the best thing to do is to put it in the record.

MS. SUSAN SAUPE: It's more a question about the availability of information that you are

distributing. I'm just curious if the .gis file can be made available or if -- I have only been able to find them in .pdfs. When you start talking about combinations --

MR. JOHN CALLAHAN: I'll get together with you after this. We will get it for you.

MS. SUSAN SAUPE: Thank you.

MR. MARK STORZER: So the first number drawn -- I'm just looking at the last two numbers on the ticket. 55.

Come on up here. Before you start, state your name, spell your name for Mary so she can go ahead and get it recorded.

MR. GARY OSKOLKOFF: My name is Gary Oskolkoff. Last name is O-S-K-O-L-K-O-F-F. I'm an Alaska Native. I was born in Homer. I'm a lifetime resident of Ninilchik. I grew up in what I'll call a quasi-subsistence lifestyle. That is, I was a commercial fisherman on my family's beach site since the age of three. We probably ate as many as we sold -- and that's not an exaggeration -- plus quite a few other creatures. Later on I served with the Ninilchik Traditional Council on their board of directors when I was a young man. And everyone at that time was around retirement age on the remainder of the board. They drew me in based on the fact that they felt they needed some youth, and I was the only

one stupid enough to take up that option. The good thing was that I was charged back in that time of writing the tribal boundaries doing the organic documents for the tribe and interpreting all that thousands of years of history from the tribal elders into something that was digestible for Western society that could work with the government.

Our tribal boundaries run from the mouth of the Kasilof River out through Tustamena Lake right up the middle of the river, run down through the mountain range, the top of the mountain range down to the Fox River and then out to the tip of the Homer Spit. The part that most people forget in that is that it also runs across the inlet and takes in that area that is within the Cook Inlet Region, Incorporated area over on the other side of the inlet and the water in between, and then runs north up to the tip of Mt. Redoubt and then across back over to the other side. So it takes quite a bit of area.

That was a negotiation between the Kenaitze Indian Tribe and the Seldovia Tribe that would cover the entire Cook Inlet region and we hoped that all the other tribes would cover all of Alaska as they had until a couple hundred years ago.

I eventually served as chairman of that tribe for a short period of time. After that I was -- I went into

private business investing in property and those kind of things. After that I ran the Ninilchik Native Association, which is their profit arm, basically, if you want to put it that way. I was the president, chairman and CEO. I've also sat on the board of directors of the AFN, the Cook Inlet Tribal Council, the Southcentral Regional Subsistence Committee. And in my youth I've worked in canneries. I worked at the Tesoro refinery. I worked for the DOT. I've done every job, pretty much, you can do around here. I wouldn't say any of them well, but I contributed.

Currently I own and operating -- I make my living through Oskolkoff Investment Company, which is my personal investment company, buying and selling real estate, developing subdivisions, building houses, those kinds of things.

And I also own a company called Oskolkoff Energy, which is just basically a holding -- a research and holding company for information regarding oil and gas and other valuable resources, some of which are much more natural than that within the state of Alaska.

I've done -- when I worked for the native association, one of the things that came up is we had to still select lands that were supposed to be made available in 1971, but of course they didn't really show up until around 2010, 2012 I believe before that was finalized. And during that time, I was approached by a gentleman who is a friend of a friend who wanted to do some research on oil and gas. And that's the genesis of the energy company that I have.

What I found is that there is a vast pool of oil and gas on the other side of the inlet on land. What I wanted to tell you was that after finding that, I went to the subsurface owners, which is Cook Inlet Region, talked to them about it. They were interested. They wanted an oil company to come in and do something with it. So I went and talked to Hilcorp who were doing research in the area at the time. They weren't interested in it. They were actually doing seismic lines by it. But they said it's too far from infrastructure. It's doesn't make any sense. So I talked to Apache and had no luck there. Same thing. It's just too far from infrastructure, doesn't make good sense. It has to be -- even if it were extraordinary, it's just too difficult to make that transition. And they are all looking for an easy way of aligning with the current pipeline systems and those kind of things.

The gist of what I wanted to get across was that I'm not for or against. I'm not a proponent or want to stand in anybody's way of doing one thing or another. I think it should be done cleanly and efficiently and done

properly. But I do think in this particular case after looking at it and looking at all the research that has been done in this area and all the research that I've put together -- and like I say, it's a decade and a half or so of research that I've done. I've read every document in the archives and everything that's there.

The gist of it is is that this is probably for the industry about two to three decades too early. There is just not structure involved there. Things really don't make sense now. If you go out there and do some seismic work and want to spend money on it, make a good find out in the middle of nowhere, well that would change the perspective, but who is going to spend their time on that, I think, at this point. So to me it just seems like one of those things that should be held off. And as a Native person I tend to think in -- in longer periods of time, I guess, than the next few years. And I think it's probably something really, honestly, for the next generation rather than me. I think that's kind of just skipping on that part.

That's really what -- thank you.

MR. MARK STORZER: No. 54.

MR. GEORGE PIERCE: My name is George Pierce. I live in Kasilof, Alaska. I'm against the sale of these leases. We got 224 blocks for sale. And I'm

going by an article I read in the paper. Average block is nine square miles. 2006 to 2010 lack of interest by big oil industries. Lack of interest. 2016, no bids due to lack of participation due to low oil prices. We already have an above historical average of oil and gas leases in Cook Inlet currently. 335 tracts leased totaling over 900,000 plus acres of state land in Cook Inlet today.

Our marine life is disappearing. Concerns for sea otters, sea lions, whales, beluga whales, our salmon, our halibut are shrinking. This is important to every Alaskan. Let's not forget our subsistence way of life. Everybody using that -- well, a lot of people are using that inlet for survival, commercial fisheries. There will be lots of environmental concerns. And why do we risk a nonrenewable resource over a renewable resource like fishing?

Alaska is in a deficit. We are nearing a recession. We can't afford to subsidize another Cook Inlet discovery. We hear this sale is for the Alaskan people. That's not true. It will be used for Donlin Mine, Pebble Mine, Chuitna Mine, all of these other foreign companies. We saw oil companies testify to our legislators since the passage of SB-21 when companies testified said they weren't going to drill till prices get to 70 to $80 a barrel. The EIA says oil won't reach $70 till 2022, if

that ever happens.

The oil industry has been -- has laid off over 3,000 workers. I suggest that you wait until 2020 before offering any more leases in the Cook Inlet.

And I've got a couple questions. What two companies requested this? Why now? And why don't -- why didn't they bid on the leases from this year? That's my testimony. Thank you.

MR. MARK STORZER: All right. So far that's the two folks we had signed up for testimony. So if there is anybody else that wants to testify, you can certainly do that. For those came in after we started, we do have like a 15-minute presentation that we will show again. And then any time if you decide you want to testify, that's fine, because, again, this is a -- this is a public hearing, so it is to gather testimony.

And again, I really appreciate people coming, spending the time because it -- it is used. I mean, I know sometimes people may not think it is used, but it is part of the record. And again, I encourage people, if you are interested, to go to regs.gov and look at all the input. And all of the input will be part of the Final Environmental Impact Statement so you can see that. But you can see what kind of feedback and comments are coming into the process.

MIDNIGHT SUN COURT REPORTERS (907) 258-7100

22

But at this time we don't have anybody else scheduled to testify, so we will just take a short break, and then we will go ahead and show the presentation again. And we will just take a break, Mary, for the record.

(Off the record.)

(PowerPoint presentation shown again.)

MR. JOHN WILLIAMS: John Williams. I am the president of the Cook Inlet Regional Citizen's Advisory Council. We were mandated under OPA 90 25, almost 26 years ago. Our primary mission is to work as oversight to the oil industry in the entire Cook Inlet, which also will cover the entire proposed lease area that you are proposing now. We have oversight of everything from drilling, production and transportation of oil throughout the entire region.

And my purpose in putting my name on the record is to advise you that you have clear access to all of our documentation. Anything that needs to be taken from us for the Environmental Impact Statement we have available for you. Over the last 26 years, we have spent millions upon millions of dollars doing research on the entire Cook Inlet. Sue Saupe who just left, I was hoping she might have a little bit of input, but Sue prefers to do all of her input comments in writing. And she's been primarily our responsible scientist for all of this material.

MIDNIGHT SUN COURT REPORTERS (907) 258-7100

23

So it's all available. It's all available for the general public through our website. We also have just produced hundreds of little plug-in thumb drives for your computers that has a tremendous amount of information about our organization. A lot of people don't even know we are here.

So my only final comment is that you are more than welcome to get in touch with us at any time. You have access to all of our information with regards to your Environmental Impact Statement. And we do intend to be here for the next 25 years, as well, with oversight.

In the mandate from OPA 90, we were -- there were only two of us that were organized. And we are fully funded not by government dollars, but by those people that are responsible for that work that we oversee. It in no way mitigates the fact we have a responsibility to take care of the inlet. It has nothing to do with the fact that they are paying us to do it because they get in a lot of trouble from us every now and then.

So I want to thank you for organizing the group and bringing your group here this afternoon. And we will see where the Environmental Impact Statement takes us.

Thank you.

MR. MARK STORZER: Thank you. Anybody else want to testify? And again, you can always put

MIDNIGHT SUN COURT REPORTERS (907) 258-7100

24

comments in online.

MS. DEIRDRE COVAL: I'll say something. Deirdre Coval. They do need to take into consideration the areas where the belugas are going to be in the lease sale and with the seismic testing because it does affect those animals. And the critical habitat. So all of those really need to be taken into account in that final lease sale.

I also have another question, and that is: Where are they intending to sell this gas? Because currently we have gas that we can't sell. We are going on a lease sale, you know, for something that people aren't currently buying. The Chinese aren't buying it. Nobody is buying anything from -- the oil and gas from Alaska right now. So I think that before they start doing more drilling and doing this, that they need to really find out that they have a place to sell this before they do something with it.

MR. MARK STORZER: Thank you. Anybody else? If not, we will take a break, Mary.

(Off the record.)

(PowerPoint presentation shown again.)

MR. MARK STORZER: All right. That's the presentation. And what we had done earlier, since this is a public hearing, is we had drawn numbers to determine the

MIDNIGHT SUN COURT REPORTERS (907) 258-7100

25

order of people testifying. Everybody got five minutes to provide their testimony.

MS. LAUREN MOSS: Oh, five minutes. Yea.

MR. MARK STORZER: And if they wanted another round or had more to say, we would give additional five minutes or more time. Typically that seems to work pretty well. So -- and we have had four people so far testify tonight. So --

MS. LAUREN MOSS: And that's not too helpful.

MR. MARK STORZER: Well. And providing testimony is only one way --

MS. LAUREN MOSS: Yeah. You can go online or mail in written statements, blah, blah, blah.

MR. MARK STORZER: So that's -- I mean, this is only one avenue to do that. So are you going to want to testify?

MS. LAUREN MOSS: Yeah, sure.

MR. MARK STORZER: So we will go ahead -- obviously we don't have to draw a number or anything this time. If you state your name and spell your name for Mary because she's recording it all. So --

MS. LAUREN MOSS: Okay. My name is Lauren Moss, L-A-U-R-E-N M-O-S-S. And I'm Post Office Box 1815, Soldotna 99669. Okay. That's it, right? So I can start?

MR. MARK STORZER: You can start. You can come up or you can sit there if you want.

MS. LAUREN MOSS: I can sit here. What page do you have the stated objectives for my comment? Do you have that on any of these pages so I can just go down the list? That's in here somewhere?

MS. SHARON RANDALL: The ones we had up on the screen?

MS. LAUREN MOSS: No, the ones you had on the screen. Are they in this handout? Because I've dealt with EISs a lot. It makes so much more sense just to speak to the points that they want to address, so -- yeah, if that would be possible. I'll give you a little job security and have you pull that back up. Bingo. Okay. Cool. Thanks.

First of all, I just wondered, the draft EIS -- according to this presentation, I'm not sure it really is considering all the habitat species, places and activities that are going to be affected.

And what I think is missing is, first of all, the king salmon migration path. I'm concerned about the fact that our numbers are dropping. And I'm really concerned about plugging in a bunch of wells in their migration path. I mean, we are having -- it's such a brittle

population. I'm really concerned about anything out there additional because what's there right now apparently somehow is impacting it too much already.

And the other thing is you talked a lot about otters and seals, but -- and belugas. You know, those were some nice tag lines, but unfortunately we are finding large mammals on our shores in Cook Inlet deceased for whatever reason. And I don't think those have been taken into account at all in this -- in this overview that I got. So maybe -- I have to go through the pages and get online and see if I see anything that addresses it.

And first of all, I just think the least obnoxious alternatives are Alternative 2 and Alternative 6 with, slash, 5 combined because it impacts the salmon fishery less. And 6 is just better because I just think Cook Inlet is having too much trouble with their migrating fish species and with the large mammal population, particularly the whales. And I don't think it -- the EIS characterizes the potential impacts because of that.

I think they don't -- there is no mention about sound impacts, underwater sound impacts versus the mammals. I mean, water carries sound for hundreds of miles, and it's even a better conductor of sound than air because it can just sustain sound for a long ways. And whales have been known to send signals about migration, feeding, and mating

hundreds of miles at ultralow frequency. And I'm really concerned that there is nothing mentioned here about that.

There is also -- there is also -- the water quality, that's really huge because -- and the reason I'm concerned about that, there is no addressing in here of the -- the market for oil controls the quality of bidder that we have. And right now with the price dropping, we're going to get low ball bidders, and we are going to get some real budget problems with these low ball operators. And when they can't afford to be here anymore, they are just going to leave and the state we'll be left with the impacts.

The state is left with the water quality impacts, and I think that's really huge because those are really long terms. And right now we are really dealing a lot with the federal government about going around and working with the impacts from the legacy wells that were drilled in the '40s and the '30s. I mean, we are still discovering what a mess those are. And I -- I'm afraid if we punch too many holes in Cook Inlet, the water quality in the long term after the Feds are not interested in leasing anything because the market has gone flat for oil -- that's what's going to control the interest, and when the interest is gone on a fiscal level, we are going to lose anybody helping us, including the federal government, with our water quality.

Those are the two major points that I think are not addressed in here. And I suffered through -- I'm a commercial fisher that suffered through the Exxon Valdez catastrophe. I went down the whole road. I mean, I was fishing in Prince William Sound and I watched it come and I watched it go. And I can still go out to my fish site and dig a three-foot hole and there is still oil down there. It just stinks. Doesn't go away.

So it's much more -- after you -- even after they complete their lease term, we are -- we might still be stuck with the impacts. And I really don't think the Feds do a really good job following through helping us mitigate those impacts. So you know, migration, breeding. Species you left out are the king salmon and the large mammals. The noise and the water pollution. I just think those impacts are going to be huge.

And I don't know if you have ever considered what it would be like to go to a -- have your hungry -- your family be really hungry, take them into a market to get food when you really need food, turn off the lights, have your children lose track of you and have a loud -- you know that horn that goes off when they make a goal at the hockey games that's so obnoxious and you just think I can't come back if they don't stop doing that because it's just too loud. It's not good for my family.

Well, if you consider having that horn going off 100 percent of the time while you are in there shopping and then in the dark losing contact with your children and then -- and then having -- no matter how long you are in that store, if you can't hear what's going on and you have so much noise and it's dark and you can't find your children, you can't get the food to feed them.

And that is what it's like for a large mammal that comes into a high impact -- noise impact area. They can't -- they see with -- with sound waves and hydraulic waves in the water. And that's what it would be. That's the comparable impact is you will -- you will be in that supermarket trying to find your children, trying to find the food to feed.

And that whole line of leases blocks off, makes a net across the lower part of Cook Inlet where we have large mammals eating capelin, sand lance and herring. And this is during a time -- the period that you mentioned that they would be -- you know, the reduced impact time window, that's right when they are in here getting sand lance and capelin. So there is really no best time that the migrating whales aren't dipping into Cook Inlet and accessing those resources. So that needs to be thrown in there.

I want -- I would like to see some numbers that would reflect the feeding periods of the large whales, plus the long-term mitigation, water quality impacts and the -- and the -- and any documentation of research regarding schooling salmon and -- and noise and obstruction, physical obstruction.

MR. MARK STORZER: Okay.

MS. LAUREN MOSS: Anyway, that's it. That's my list, my laundry list. Nice presentation. That helped a lot.

MR. MARK STORZER: Like you said earlier, you can go online and submit comments.

MS. LAUREN MOSS: I'll probably do that, too. But, you know, whenever you guys take the trouble to come all the way to the north 40, I appreciate it. So I'll come in here.

MR. MARK STORZER: We appreciate you taking the time coming in.

MS. LAUREN MOSS: Usually -- you guys have it good. The Forest Service hearings are, like, okay, you are done, get out of here. So it's much nicer. The Department of Agriculture isn't as friendly.

MR. MARK STORZER: Thanks for coming.

(Proceedings adjourned at 7:40 p.m.)

REPORTER'S CERTIFICATE

I, MARY A. VAVRIK, RMR, Notary Public in and for the State of Alaska do hereby certify:

That the foregoing proceedings were taken before me at the time and place herein set forth; that the proceedings were reported stenographically by me and later transcribed under my direction by computer transcription; that the foregoing is a true record of the proceedings taken at that time; and that I am not a party to nor have I any interest in the outcome of the action herein contained.

IN WITNESS WHEREOF, I have hereunto subscribed my hand and affixed my seal this 1st day of September 2016.

MARY A. VAVRIK,
Registered Merit Reporter
Notary Public for Alaska

My Commission Expires: November 5, 2016

OFFICIAL SEAL
STATE OF ALASKA
NOTARY PUBLIC
MARY A. VAVRIK

INDEX

Public Hrg Draft EOS Cook Inlet Lease Sale 244 - Kenai

August 18, 2016

ALASKA OUTER CONTINENTAL SHELF
DRAFT ENVIRONMENTAL IMPACT STATEMENT
PROPOSED COOK INLET LEASE SALE 244
PUBLIC HEARING
Homer, Alaska

Taken August 17, 2016
Commencing at 5:15 p.m.

Pages 1 - 70, inclusive

Taken at
Alaska Maritime National Wildlife Refuge
Islands and Ocean Visitor Center
95 Sterling Highway
Homer, Alaska

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Mary A. Vavrik, RMR

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Office Assistant

P-R-O-C-E-E-D-I-N-G-S

MR. MARK STORZER: Good evening, folks. We will go ahead and get started. I'm hoping everybody is here for the public hearing on the Draft Environmental Impact Statement for the Cook Inlet Lease Sale 244. That's what the meeting is about. I'm Mark Storzer. I'm the Regional Supervisor for Office of Environment with the Bureau of Ocean Energy Management in the Alaska Region. So we're here out of Anchorage.

We are here tonight, you know, for a public hearing. So this might be a little bit different format than folks might be used to with scoping meetings and stuff because this is actually a hearing. And tonight's hearing is a very important part of the process to get input from the public, to get your testimony. It will actually be recorded by the court reporter, being Mary over here. She will be recording everything. KBBI is also here, and they have a recording going. They will be recording any testimony that's provided tonight.

So like I said, I'm very glad people are here because this is an important part of the process to give public input, particularly in this situation on the Draft Environmental Impact Statement because that's really the focus of tonight's hearing.

What we will do tonight is -- since it is a hearing,

we have some folks that have signed up to testify. And what we'll do is initially everybody will have five minutes to testify. And what we will do is we will draw numbers. And that's why if you signed up to testify, hopefully you got a ticket, and we will draw those numbers so we get a random order of testimony. And we do that -- we really like to have the court reporter here so we have the transcript of the hearing. And that will actually be included in the Final Environmental Impact Statement so everybody can see what was said and all the comments that are captured accurately.

So tonight we can take testimony. Like I said, we will start off with five minutes apiece. If we get through with that, we will go ahead, and if people want to provide additional testimony, we will give folks another five minutes or so to do that. And we will do that until everybody has provided the public testimony they want to provide. If we are done with that and there is still time and you prefer to talk to the court reporter, Mary, one on one, let us know and we can set that up so you can talk with Mary one on one for five minutes and provide your testimony that way.

We also have three computers in the back that you can enter your comments into on regulations.gov. If you prefer to enter your comments tonight in that method,

that's fine, also. And any time you want, you can go on line to www.regs.gov and provide your testimony or your comments between now and the end of the comment period.

So like I said, it's a hearing. It's not as much back and forth as some folks are maybe used to, but we're here to get your testimony so we can use it to inform the Draft Environmental Impact Statement. And we will use that input in the production of the Final Environmental Impact Statement.

And I always like to remind folks at this point, we are at the point in the process of finalizing the Environmental Impact Statement. But there has still been no decision made on whether or not a lease sale will actually occur. You know, the plan will be in -- you know, once the Environmental Impact Statement is complete, that's used to inform the decisionmakers on whether or not to actually hold a lease sale. But at this point we are just looking at did we get it right in the Environmental Impact Statement.

So what we will do tonight is we have about a 15-minute -- 12- to 15-minute presentation that just gives an overview of what's in the Draft Environmental Impact Statement. It's a voiceover so that's the reason we have closed the doors is it -- it's not -- maybe a little bit difficult to hear, but if we keep it quiet in here, I think everybody will hear it very well. We also have it on a laptop in back so if later on if you want to listen to it, you can do that.

And what we will do tonight is after the presentation, we will break for a minute or two and just make sure we have everybody who wants to testify signed up. Then we will draw numbers and we will start the testimony. Like I said, we will give everybody five minutes. Who is going to do the timing here?

MS. SHARON RANDALL: I can.

MR. MARK STORZER: We will keep it timed, and we will let you know when you get done. Like I said, if people get done and there's still more time, we will do another round of testimony. If we get through everybody early, we'll just take a break. We'll keep the record open and if other people come or decide that they do want to testify afterwards, that's fine. That's what we are here for. Sign up and we will do another round of testimony.

MR. BOB SHAVELSON: Will there be an opportunity to ask questions and have a dialogue?

MR. MARK STORZER: No, not in this situation. The best thing you can do if you have questions or whatever, submit them as part of your testimony, and then it's -- it's part of the process to

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get it into the record.

MR. BOB SHAVELSON: I guess one of the frustrations I would feel is that we have you here in person now, and submitting comments can drive responses in there, and we don't get that dialogue. We don't get the chance to ask questions and get answers. Now we have that opportunity, so what would stop you from, for example, answering questions?

MR. MARK STORZER: Well, it's just the hearing process just to get the input on the Draft Environmental Impact Statement. None of us are decisionmakers in this process so, you know, we are here just to gather the information.

MR. BOB SHAVELSON: My name is Bob Shavelson, and I'm with Cook Inletkeeper. But I'm frustrated because we have gone through so many iterations of these things, and our comments always get brushed aside; yet there is no opportunity to actually get people in the room and have a conversation with humans. So we have that here, so if there is going to be extra time, doesn't it make sense that we have a discussion?

MR. MARK STORZER: Not for a public hearing, Bob.

MR. BOB SHAVELSON: Why don't you conclude the public hearing and let us have a discussion?

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MR. MARK STORZER: Because we're here to collect the information in a hearing format, to gather the information. And you have the opportunity -- this is your opportunity to voice those questions and concerns, get them into the record so they can be addressed because all the -- all the testimony and stuff that we get tonight, like I said, it goes into the Final Environmental Impact Statement and will be responded to in that process.

MS. ROBERTA HIGHLAND: Could you give your name again and spell it and give a phone number?

MR. MARK STORZER: Sure. I'm Mark Storzer. It's S-T-O-R-Z-E-R. I'm the Regional Supervisor for Office of Environment. And my office phone is (907) 334-5272.

MS. ROBERTA HIGHLAND: Thank you.

MR. MARK STORZER: You bet. So I think what we will do now is, like I said, we will run through --

UNIDENTIFIED FEMALE SPEAKER: Could you repeat that phone number?

MR. MARK STORZER: (907) 334-5272.

UNIDENTIFIED FEMALE SPEAKER: Regional Supervisor of what?

MR. MARK STORZER: For Office of Environment.

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UNIDENTIFIED FEMALE SPEAKER: That's a federal job?

MR. MARK STORZER: Yes. It's with Bureau of Ocean Energy Management, Department of Interior. So we are the agency responsible for producing the EIS. And we cover that a little bit in the presentation.

UNIDENTIFIED FEMALE SPEAKER: So you are from Outside, not from Alaska?

MR. MARK STORZER: Alaska Region, so we are from Anchorage.

MS. ROBERTA HIGHLAND: I lost my ticket immediately.

MS. SHARON WARREN: We will get you another one. Not to worry. I'll get you one right now.

UNIDENTIFIED FEMALE SPEAKER: Would you get one for me, too? Let's go ahead, Sharon, and get started. Like I said, it may be a little bit hard to hear, so we will do our best.

(PowerPoint presentation:)

Welcome to the public hearing for Lease Sale 244 in the Cook Inlet. This presentation, as well as a summary handout available in the hearing, will provide you with information on the Draft Environmental Impact Statement, or EIS, for the proposed Lease Sale 244. It will also cover how to submit comments and what types of comments are most helpful in developing the final EIS.

The Bureau of Ocean Energy Management, BOEM, is a bureau of the U.S. Department of the Interior, and it's the federal agency responsible for managing orderly development of both the energy and mineral resources on the Outer Continental Shelf, or OCS, in an environmentally and economically responsible way. BOEM is the lead agency and has worked closely with the National Park Service as a cooperating agency on the preparation of the draft EIS.

BOEM is proposing to conduct the Cook Inlet oil and gas Lease Sale 244 in June 2017 and is preparing an EIS to address potential environmental impacts resulting from typical lease sale activities. This public hearing is being held in order to receive input on the draft EIS so that we may incorporate your comments into the final EIS.

The proposed lease sale is located in the northern portion of the Cook Inlet planning area and includes 224 blocks, each block being approximately three miles by three miles square. In total, the proposed lease sale area covers approximately 1.09 million acres, or about 20 percent of the Cook Inlet planning area.

We used a targeted leasing approach to define the proposed sale area. Targeted leasing identifies areas considered for leasing that have high resource potential and clear indications of industry interest, while weighing

environmental protection and subsistence use needs. The overall goal is to focus oil and gas leasing on the most promising blocks, while still protecting important habitats and critical subsistence activities.

As a result of this approach, the proposed lease sale was limited to only 20 percent of the Cook Inlet planning area, and it excludes most of the subsistence use areas for the Alaska Native villages of Nanwalek, Seldovia and Port Graham. It focuses on areas closer to existing infrastructure needed to support exploration activities and on areas adjacent to active State leases.

It avoids the vast majority of the designated critical habitat for beluga whales and northern sea otters. It completely avoids the critical habitat for the stellar sea lion, and it reduces effects to several national parks, preserves and wildlife refuges, including Katmai National Park and Preserve, Kodiak National Wildlife Refuge, Alaska Peninsula National Wildlife Refuge, Becharof National Wildlife Refuge, and the Alaska Maritime National Wildlife Refuge.

Once the sale area was defined, we published a Notice of Intent to prepare an Environmental Impact Statement which began the public scoping period. Between October 23rd and December 8th, 2014, we accepted comments on the proposed lease sale, both online and at five public

meetings held in Kenai, Homer, Seldovia, Nanwalek and Anchorage.

The comments received during the scoping period identified several issues and concerns, including the potential impact to subsistence uses and to commercial and sport fisheries, the effects on critical habitat for beluga whales and northern sea otters, the effects of drilling fluids and cutting discharges, and the effects on local communities of a potential oil spill in Cook Inlet. All of these issues and concerns gathered during the scoping process were used to develop the alternatives and mitigation measures analyzed in the draft EIS.

The draft EIS identifies six alternatives, two of which were further subdivided. So there are a total of nine alternatives evaluated in detail: Alternative 1, the proposed action; Alternative 2, the no action alternative; Alternative 3A, the beluga whale critical habitat exclusion alternative; Alternative 3B, beluga whale critical habitat mitigation alternative; Alternative 3C, the beluga whale nearshore feeding areas mitigation; Alternative 4A, the northern sea otter critical habitat exclusion alternative; Alternative 4B, the northern sea otter critical habitat mitigation alternative; Alternative 5, the gillnet fishery mitigation alternative; and Alternative 6, the prohibition of drilling discharges

alternative.

Alternative 1, the proposed action, offers for lease all of the 224 blocks in the northern portion of the Cook Inlet planning area. Alternative 2, the no action alternative, would result in no lease sale being held in June 2017.

Alternatives 3A, 3B and 3C were developed to address concerns about potential impacts to the endangered Cook Inlet distinct population segments of beluga whales. Alternative 3A, the beluga whale critical habitat exclusion alternative, would offer 214 blocks for lease, but would completely exclude from leasing the ten blocks highlighted on this map in purple that overlap the beluga whale critical habitat at the northern end of the proposed lease sale area.

Alternative 3B, the beluga whale critical habitat mitigation alternative, would offer all 224 blocks for lease; however, lessees would not be allowed to conduct marine or geohazard seismic surveys or exploration drilling in the ten lease blocks highlighted on this map in purple that overlap the beluga whale critical habitat during the five months from November 1st through April 1st of each year when beluga whales would most likely be in the area.

Alternative 3C, the beluga whale nearshore feeding areas mitigation alternative, would offer all 224 blocks for lease. However, lessees would not be allowed to conduct marine seismic surveys from November 1st through April 1st of each year when beluga whales would most likely be in the area. Additionally, lessees would not be allowed to conduct marine seismic surveys between July 1st and September 30th on the 146 blocks highlighted on this map in aqua located wholly or partially within ten miles of major anadromous streams where belugas are likely to be migrating from their summer feeding areas.

Alternatives 4A and 4B were both developed to address concerns about potential impacts to the critical habitat of the threatened northern sea otter. Alternative 4A, the northern sea otter critical habitat exclusion alternative, would offer 217 blocks for lease but would completely exclude from leasing the seven blocks highlighted on this map in aqua that overlap with the northern sea otter critical habitat.

Alternative 4B, the northern sea otter critical habitat mitigation alternative, would offer all 224 blocks for lease while prohibiting lessees from discharging drilling fluids and cuttings and conducting sea floor disturbing activities, such as anchoring and placement of bottom-founded structures within 1,000 meters of areas designated as northern sea otter critical habitat

highlighted on this map in aqua.

Alternative 5, the gillnet fishery mitigation alternative, was developed to address concerns regarding the Cook Inlet gillnet fishery. This alternative would offer all 224 blocks for lease, but lessees would be prohibited from conducting seismic surveys on the 117 full or partial blocks north of Anchor Point during the drift gillnetting season as designated by the Alaska Department of Fish & Game. Typically the drift gillnetting season runs from mid June to mid August.

In addition, lessees would be advised of when the fishery operates and would be required to notify the local drift gillnet fishing organization of any temporary or permanent structures planned during the season.

Alternative 6, the prohibition of drilling discharges alternative, was developed to address concerns regarding potential impacts of discharging drilling fluids and cuttings from exploration into Cook Inlet. Under this alternative, all 224 blocks would be offered for lease. However, the discharge of all drilling fluids and cuttings into Cook Inlet from exploration would be prohibited.

There are four levels of impacts described in the draft EIS: Negligible, minor, moderate and major. These levels take into account the context and intensity of the impact based on four parameters: Detectability, duration,

spatial extent and magnitude. We use the best available information and science along with professional judgment to determine the level of impact from negligible to major. Impacts that fall in the category of major are considered to be significant under the National Environmental Policy Act. It should be noted that for biological resources, impacts are determined based on changes to the entire stock or population rather than on an individual.

The impact analysis for each resource and alternative is fully described in chapter 4 of the draft EIS.

The notice of availability for the Draft Environmental Impact Statement was published on July 22, 2016, beginning a 45-day public comment period which will remain open through September 6, 2016. We will use the comments received during this period to revise the draft EIS as needed and may release the Final Environmental Impact Statement and Record of Decision in early 2017. The Cook Inlet Lease Sale 244, if approved, will be held in June 2017.

There are several ways to provide comments on the Draft Environmental Impact Statement. You may provide testimony at this hearing either publicly or individually. Additionally, you may visit www.regulations.gov to submit your comments online. You may do this on your own, or if you choose to submit online comments tonight, you may

visit one of our computer stations to do so. Search for Docket No. BOEM-2014-0001. The entire draft EIS, as well as other information regarding the proposed lease sale, would be found on BOEM's website at www.boem.gov/ak244/. Or you may request a CD copy from our staff at this hearing.

Your comments and testimony here tonight will help us improve the information disclosed in the EIS and provide a clear basis for choice between alternatives. It is important to remember that EISs are not decision documents. Ultimately the Secretary of the Interior will make the final decision whether to hold, modify or cancel the lease sale and may choose one or any combination of alternatives in that decision.

Certain types of comments are especially helpful in ensuring we use the most accurate and sound information in finalizing the EIS. Merely providing comments such as, I'm in favor of the project, or I oppose the project, are not very informative.

Thank you for coming this evening and sharing your thoughts on the draft EIS for the proposed oil and gas lease sale in Cook Inlet with us.

(End of PowerPoint presentation.)

MR. MARK STORZER: All rightie. A couple things I just wanted to emphasize that were just stated in here, but I wanted to make sure it's clear to folks, that there has been no decision made on whether or not a lease sale should happen. And your input does influence, you know, what decisions do get made. So it is critical to give the input. And I know sometimes, you know, people want to have more back and forth, but the best thing that you can do, really, is provide input through this process through the hearing process or online or whatever so those comments are part of the process and can be addressed.

Another thing that I'd like to point out is a lot of times in an EIS like this, there is six alternatives, and two of them have been subdivided. And the decision doesn't have to be just one of those alternatives. It can be one or it can be any combination of alternatives because sometimes we hear, well, we shouldn't have to pick between beluga whales and the sea otters or subsistence. And it can -- the final decision, if it was made to have the lease sale, could incorporate several of those alternatives.

UNIDENTIFIED FEMALE SPEAKER: Or all of them?

MR. MARK STORZER: Well, yes, all of them except for the proposed action/no action. That wouldn't work. But it can be any combination of those alternatives. So that -- I just like to point that out

because a lot of times you kind of look at it, and the way it looks it's like one or the other, but it can be any combination.

So did everybody who wants to testify get signed up at least at this point? Like I said, as we go along, if you want to testify, just go ahead and --

Go ahead and get this gentleman signed up, and then we will draw the first number. And we will actually draw two numbers to begin with, one for the first one, and then I'll have that person draw the next number so who's ever testifying next will be ready to testify. John, did I miss anything?

MR. JOHN CALLAHAN: The only other thing -- my name is John Callahan. I manage public affairs for the Alaska Region. The only other thing I'd add to what Mark said is a lot more information about this whole process is available at that website boem.gov/ak244. There is copies of the draft EIS itself. And if you read through the chronology, you can sort of get a sense of how this process has developed at this point.

MR. MARK STORZER: What we will do is -- Sharon, you want to have someone draw the first number?

UNIDENTIFIED FEMALE SPEAKER: Are we supposed to put them in there?

MS. SHARON WARREN: No. You have half of

them.

MR. MARK STORZER: What I'll do is I'll just read the last two numbers of your ticket. So the first number is 50. 50. That's you. So --

MS. SHARON WARREN: So you are going to select another one so we can have somebody waiting. So 46 will be next. And just when you start -- before you start to testify, if you could state your name and spell it for Mary, that would be great. So 46 is the next person.

If you want to come up front here, that would be great.

MR. GARY SHERIDAN: My wife pressured me into this. My name is Gary Sheridan. I'm a resident of Anchor Point, local fisherman and outdoorsman. I have been here -- down here about ten years or so. I'm very involved with fishing on the Anchor River, as well as halibut fishing out in the local area.

I guess the main thing, just skimming through the material -- I haven't had a lot of time to review it all, but I'm really concerned about the impact of the whole laundry list of resources in this -- that could be affected by a major spill or a problem with the oil development. It starts out with -- from minor to moderate to major. And in the document it talks about moderate, and moderate seems fairly reasonable that we might expect,

well, that's okay. But impacts of moderate are long lasting and widespread, but less than severe. Well, you know, how do you -- how do you cut all this stuff up?

To go on, it talks about major impacts or severe. And then it talks about there will be -- for this analysis that was done, it says that BOEM assumed one large spill will occur, and then in another place it talks about in the 40-year period of the life of this particular oil development, it -- there is a 22 percent chance of a large spill or a large serious problem.

In my view, I don't think that the lease should be given at all, period. From what I'm reading here, it doesn't give us enough to say that, oh, it's okay if we have a moderate spill or an extreme one.

That's my position. Thank you.

MR. BOB SHAVELSON: Thank you. My name is Bob Shavelson. I'm the executive director of Cook Inletkeeper. And I thought it was interesting you said a 22 percent spill. Back in 1997 with Lease Sale 149 there was a 72 percent chance of a major spill, and nothing that I know has changed the technology in oil and gas drilling and development that would reduce that number so low.

As I mentioned before, I'm concerned about the public process here, and I'm disappointed -- I expressed to Mark that we don't have an opportunity to go back and forth. I think we are all humans here. We don't need to go through a rote PowerPoint presentation. And we should have the opportunity to do that, so.

And this process, I think, has been fraught from the beginning in the scoping process for this. We got a phone call three hours before the scoping meeting, and we were told it was going to be at the middle school, and then the meeting was moved. And so we had three hours' notice to come to a scoping meeting. And there were very few people there. In fact, I think I was the only person there. So it doesn't seem like there was a real attempt to get people in the room to get that input. Similarly in Kenai, the scoping meeting was held on a Friday night, and there was one person there. It was our board president.

So I'm not exactly sure why we're here. We have been through a number of oil and gas lease sales. And the past three sales -- so we had Lease Sale 191 in 2004, Lease Sale 2011 [as spoken] in 2009, Lease Sale 219 in 2011 resulted in zero bids and zero acres leased at a cost of at least tens of millions of dollars, I would assume, to the U.S. taxpayer. I have a Freedom of Information Act request to understand what that cost is. But it doesn't seem like there is a lot of interest here, so I don't know why we are all drug through this process once again.

But I think the more important reason here is that

climate change is the most pressing threat that we have as a people and the fact that we are going forward and leasing more oil and gas I think is casting a blind eye to this most serious issue. And if you listen to the EPA administrator, Gina McCarthy, she was just talking the other day. I heard her on the news talking about the EPA Clean Power Rule. She said 2016 is on pace to be the hottest year ever recorded by a significant margin, while 2015 currently holds the title, and 2014 before that. The facts and the trends are clear, and the threat is real. But that seems to be ignored here. And the president has been very clear that this is an important issue.

And even though you will hear people like Administrator McCarthy acknowledging obvious things that we all know about the melting sea ice and the receding glaciers, in Kachemak Bay and Lower Cook Inlet, we have seen remarkable, rapid, significant changes in the past several years. We have had massive sea otter die-offs, common murre, clam die-offs. Our water and air temperatures are so warm. We have got an incredible infestation of spruce aphids here. It's literally changing the entire landscape of our area again. We've had levels of toxic algae and paralytic shellfish poisoning that we've never seen before.

So these are things that really should be a wake-up

call, and here we are debating whether we should have more oil and gas development. And the interesting thing is the Obama Administration has put a lot of weight behind the Paris Accord and how important it was that we come together and go to these climate meetings. We failed to put a price on carbon, which to me is a fatal flaw if we're going to have a market-based system to deal with this stuff.

But there is a group called the Stockholm Environmental Institute, and they came out with a report -- and I'll submit that report for the record here. And I'm going to have more complete comments before the end of the comment period. But that report said to be consistent with the goal of keeping global warming below two degrees centigrade, which is the goal of the Paris Accords, the U.S. will need to cut aggregate fossil fuel production by 40 to 60 percent of current levels by 2040.

Under current policies, however, including the Clean Power Plan -- that's the Obama plan -- production is expected to rise by 11 percent. So it makes no sense to be offering up new federal leaseholds for oil and gas if we hope to meet the goals of the Paris Accord.

And I think one of the most disturbing things to me is that BOEM has a mandate to develop our renewable resources. And there was a final rule published in 2009

to set that plan for doing that. If you look at Cook Inlet, we have got world class renewable energy resources. We've got tidal. We've got wind. We've got solar. We have got amazing energy potential here; yet other states in the Union have got potential for the renewables and we have not. So one of my strongest comments I would urge you to take, if you are going to go forward with this, is follow the congressional mandate and develop a renewable energy plan for the Outer Continental Shelf.

So I'll wrap up there. I think my time is up. I'll just say there is no interest in this. We are chewing up a lot of tax dollars to do it. Climate change is the biggest threat, and we really need to be to getting -- follow the congressional mandate to develop renewables here.

Thank you.

MR. JOHN CALLAHAN: I can't remember if I said this before in my comments. Bob's comments about the comment period reminded me that these hearings are only part of the overall comment period. The comment period closes on September 6, and if you go to that website I mentioned earlier, it will give you instructions for commenting.

UNIDENTIFIED FEMALE SPEAKER: If we comment here and we also comment with a letter, are both comments considered?

MR. JOHN CALLAHAN: Absolutely.

UNIDENTIFIED FEMALE SPEAKER: Then we can as many times as we want?

MR. JOHN CALLAHAN: Absolutely.

UNIDENTIFIED FEMALE SPEAKER: Okay. Just needed to know that.

MR. MARK STORZER: That's why I said just because you testified tonight, you can enter it in the record as many times as you want between now and the end of the comment period. No. 51. Who is No. 51? There you go.

Actually, can I get you to draw the next number. No. 45.

MS. SURAJ HOLZWARTH: Well, I want to thank the Homer community for coming out, and I want to thank you for the opportunity to speak. My name is Suraj Holzwarth. I'm known mostly around the world as White Eagle Medicine Woman. I'm the drum keeper of the Grandmother Drum International Peace Project and the 501(c)(3) Whirling Rainbow Foundation here in Homer. I've traveled over a million miles touching a million people across 20 countries, and I'm seeing the same questions being asked and the same concerns not being addressed.

I feel what's happening right now with the oil and

gas industry is that we are standing like a lobster in boiling water, just not really realizing it's getting hotter and hotter and hotter. And it's time for us to wake up, that it is an unsustainable in every stretch of the imagination that we can come across way of dealing with energy for our future, for our children.

And when I work with the Elders across the world -- I'm part Iroquois. And in the Iroquois understanding, who were the people that started to meet with our founding fathers originally and gave them the idea of a democracy, was the understanding of the word we, the people.

And our indigenous understanding of we, the people, means the fish people, the whale people, the tree people. That's how we view the people. And I don't think that we are looking at all about the future of we, the people.

And we have had renewable energies on this planet for a long time. We had -- the gas car won out over the electric car due to greed. We have had these situations going on for a long time that these wonderful, renewable, sustainable ways to live together on this planet, which is a no-brainer -- if we can put a spacecraft around the world, we can certainly do renewable energy. And it has already been discovered and bought out by the oil industry. The same with our health care.

So we need to take a look at what we are doing and

go -- it's not -- if it's going to happen, the spill; it's when it's going to happen. That's a fact. And do we want that future for ourselves? Do we want to look out in this bay and deal with what Prince William Sound dealt with? Do we want to really say we -- we just turned around and we turned our head and said, you know, it's money in the moment? That's what we are saying. It's money in the moment because we are frightened to come off this gas-guzzling reality.

And we already have everything in place to be on sustainable energy. It's been around a long time. We have just chosen to put it under the table, mainly by the oil and gas industry.

So I'm here on behalf of my children. I have two children. I am here on behalf of we, the people, the salmon people, the whale people, the fish people that aren't here to speak for themselves and that we all know that this doesn't work as a sustainable future.

There is -- as you said so eloquently -- and I just love that you are here with all these wonderful facts to back us all up. You're doing an amazing job at Cook Inletkeeper. I want to thank you for the incredible job that you do. I want to know in any way how we can support you -- that he stays on top of this, that he has the facts that we can get behind because a lot of people don't want

to listen to my spiritual meaning of this work. But the facts are the facts.

And when we come down to it, we need to rally behind these organizations that are working hard to do that and to say it is already time for this energy to be finished and for us to move forward to a sustainable way to be on our planet, not just in Homer; but we are finding that everywhere.

And as you mentioned so strongly, no one denies the exponential global warming issue that we have that's taking us down like a ship in the night. And so it's an alarm. There should not even be a question going on in this room to testify about. There should not be anything to consider. But our lives are at stake across the world by our choices.

Mother Earth will go on without us. She has many thousands of years before and will again if she has to exterminate us like the dinosaurs to move forward. But we are the one causing our own demise, and it's time to keep our eyes really wide to the lies that we hear from the oil and gas industry about that there aren't sustainable options available.

I thank you and I bless each and every one of you in your deepest heart to go there for your children, your grandchildren and all we, the people. Thank you.

MR. MARK STORZER: No. 49, you will be next.

MS. DURA COEN: Hi. My name is Dura Coen. I've lived here a long time, and I agree with everything the grandmother drum lady just said and that Bob Shavelson just said and the other fisherman guy, also. After all that. And I'm for the no lease sale at all. There is lots of other things that you have not considered. They only considered some species, but there is thousands of species in Cook Inlet and the bay, and it affects everything. And they don't have a voice. We are their voice. So on behalf of every living creature, I say no.

And also, like Bob Shavelson said, there is a mandate for BOEM to consider alternative energy resources or solutions, and they haven't done that. There is a -- that we could use the waves from the ocean for power and they need to look into that. Climate change is destroying everything. We are on a downward spiral. It might even be too late to save this planet. I don't know. But we shouldn't just keep on to make it worse. We should at least try to slow it down.

We have to not just think of ourselves, but our future and the generations that come after us and what we are doing to this planet. So there is lots more impacts

besides the otters and the whales and the fishing and the critical habitat. There is all kinds of birds and everything. It's all a chain. Everything -- you know, everything is in a circle of nature. Everything depends on something else. Everything has a purpose. If you start drilling there, there will be discharge fluids that contaminate everything, and it goes up the food chain.

Also in places like Oklahoma and back east where they are doing fracking, there has been places where there were never earthquakes before; there is now earthquakes. And we are in one of the most seismically active regions on the planet.

MS. SURAJ HOLZWARTH: Thank you for saying that.

MS. DURA COEN: We should not be doing anything that involves fracking here. It would be devastating. I think there is a reason that oil and gas is under there, and I think it's to lubricate the planet plates. When the plates do shift, it doesn't make it as bad. But if we take all that out of there, then we are going to have lots more devastating earthquakes. And that's starting to show up in places all over the country. And just because we may not have all the scientific absolute studies and facts about it now doesn't mean if we do this that we will be so regretful in the future.

So that's, you know, what I could think of.

And also I -- I subsistence fish for fishing in the summer. I do the dipnetting on the Kasilof, and there is no way you can contain an oil spill out here. That's -- I worked on the '89 oil spill. It was horrible. There is still oil out there. They can't clean it up. I don't see how they could even conceive of cleaning up something in the region like this with the storms we have and the ocean currents. They couldn't clean up the Exxon Valdez; why do they think they could fix this.

And like they said in the paper, it was like 22 percent, or something like that, chance of a major spill; but like Shavelson said, it was like 72 percent, and nothing has changed. So basically why would they even consider having a lease sale? It doesn't make any sense. It would destroy everything in our lifetime. It would be gone, all the environment, all the reasons we live here. The short-term goal of just money instantly in your pocket or, you know, fuel for your car without developing alternatives is not worth it. This is the only planet we have to live on.

And that's about all I have to say.

MS. SURAJ HOLZWARTH: That was wonderful. Thank you.

MR. MARK STORZER: No. 44.

MS. ROBERTA HIGHLAND: Hello. My name is Roberta Highland. So I am representing myself and the Kachemak Bay Conservation Society tonight. And all the people before me have really said a lot of the things that I feel. And it's always sad for us to get -- sorry, you guys. And I know you are -- it's not your fault, but we are being drug out one more time on a summer evening when it's not raining for the first time in a long time, plus during the supper hour, and I have hypoglycemia, so if I faint, take me to the hospital.

Last summer 50 whales died in the Gulf and thousands and thousands of common murres died. Heartbreaking. We saw it. And causes are only guesses because we just have not done our job for our fellow sentient beings.

Conservation is a biggie. These oil and gas lease sales are the opposite. And that we are still going for the archaic way to develop energy is really sad. We are watching all of this happen in front of our eyes. And I suspect you folks are scientists, basically thinkers, that you are not blind to it, either. So it's -- it's just amazing to me that we have to be here.

The federal mandate to do renewables, what I wouldn't give if we weren't here right now talking about renewables. So I support only Alternative 2, which is no lease sale. All the rest of the alternative ideas, they have got some merit. If, by chance -- which how often have we stopped these? Once in a blue moon. But it's been a long time. So all the alternatives need to be done, except the first one is no lease sale.

These waters belong to all of us and kinship with all life. Seven generations is what we should be thinking about. Four Es is one of my things, that we use environment, which without the environment we have nothing; economy, energy and ethics; and that includes ethics to everything. That -- those four Es should be used for every development that is considered anywhere. And I'd like it to go worldwide.

Tonight I was reading in We Alaskans, Nancy Lord did a review of Great Tide Rising: Towards Clarity and Moral Courage in a Time of Planetary Change. Those of us concerned about climate change and other environmental threats -- extinctions, pollution, habitat loss, et cetera -- often find ourselves sinking into despair, or at least struggling to find useful responses. In the Great Tide Rising book, she gives us some open-hearted ways of facing global change.

Why is it wrong to wreck the world? What are our obligations to our children and grandchildren? How can clear thinking dispel misinformation and illogic? What can anyone do? And how can stories inspire us to move

forward with clarity and moral courage?

The sea stars, also known as starfish have -- we just saw a horrible die-off last year of the wasting disease, just wiping them out. We have got dying sea otters, 50 whales. 50 whales. So what does all this dying mean for the next generation and what does it mean for the people of the present who desperately care about the world, which are here today?

Moore holds nothing back in telling us how she reached a state of moral outrage, and she calls upon us to join the great rising tide, a phrase taken from the teachings of the Buddhist spiritual leader Thich Nhat Hanh. Together she insists we can stop the final plunder and wreck of the world. What can seem like a miracle, she says, is the everyday working of the world. We love the world and have a moral obligation to protect it. All of us do.

She describes a trip to the Galapagos Islands in Ecuador and that nation's granting of constitutional rights to the natural world, the first nation to do so. And I hope that we end up being the second one.

Ecuador's constitution grants species, ecosystems and natural cycles legal standing and prohibits actions that disrespect and damages the natural world. Pretty simple stuff.

Through the deep thinking she's done for years, she speaks to the turning that is possible, imagination creating more imagination, good creating more good, respect creating more respect in a swirling whirlwind of change that sweeps away business as usual, upends the culture of reckless exploitation. Can't say it any more than that.

I agree with everyone else ahead of me, and I just hope that someone is out there listening that has the power and that the next time we are here it's about renewables.

Thank you.

MR. MARK STORZER: 52. Will be next.

MS. DEBORAH LIMACHER: So I agree with everything that's been said. And there are so many aspects to this why I say I vote for the no action. But last night I wrote something out because I don't like talking in front of people so much. So I'll read this, and we will go from there.

My name is Deborah Limacher, and I'm a 40-year resident and commercial fisherman, now a vacation rental owner here in Homer. I've lived through the oil spill in Cook Inlet in 1987. I think it was called the Glacier Bay oil spill. I can't totally remember. I worked diligently with Exxon to clean the tar balls that traveled up into

the inlet in the 1989 Exxon oil spill where the entire drift net fishery was shut down. And I've watched my fisheries decline from its effects.

So when you were saying that -- do we want to have to deal with the spill -- the effects of a spill in Kachemak Bay, well, we did in Cook Inlet because there were tar balls that -- all throughout the rips, and there were, like, several of us that worked on trying to clean that up. And it was impossible. So think of here it is Valdez, and we were feeling the effects in June in Cook Inlet.

So I don't understand how it is that you -- it was somewhere up on the screen that you have a plan to protect the national parks like Katmai. How can you possibly say that when you see how far the oil travels? So --

Let's see. Cook Inlet is a designated commercial sockeye fishery, now a major king salmon fishery for the sports fishermen. Thousands of people from all over the state and the world travel here to see our pristine beauty.

I cannot understand why the BOEM would even consider opening up more oil and gas leases in this, our home, especially when the environment and its marine life have so many challenges with ocean acidification, climate change, seismic testing, the effects of the seismic testing, and the sound. If you watch Sonic Sea, you would understand how that destroys the whales and so much of our marine life; the platforms, the tankers, the oil spills, which I've -- I have dealt with.

To my knowledge, the BOEM is mandated to promote renewable energy production on the Outer Continental Shelf, which Bob spoke about. Cook Inlet is rich in resources that would sustain such production, assuring that this land is here for our generations to come and left pristine for the thousands that come here each and every year to enjoy our rich marine ecosystems.

And now with the further threat of fracking right here just three and a half miles off the coastline next to Stariski Creek, which is an anadromous stream where salmon run, I say no more. It's time we address climate change, stop developing more fossil fuels, and focus instead on our rich world class renewable energy resources around Cook Inlet.

MR. MARK STORZER: No. 48. You will be next.

MS. MICHAELA BAUMGARTNER: So my name is Michaela Baumgartner. I was born and raised in Austria, but I'm a Homer resident now. And I also work for the Whirling Rainbow Foundation, a Homer-based nonprofit that has traveled to 20 countries and supported many, many

sustainability projects all around the world.

In 2011 we were part of a March in Lima that prevented GMO of entering Peru, which is quite the amazing story. We were also instrumental in helping close the coal mine in Australia, and all aboriginal people got new jobs. So these are two very little examples of what we try to move in the world. And we also want to have a voice here in our own home community. And we are so happy Shell did not get to drill in the Arctic.

And today in the morning I arrived back from Mexico where I worked the last month with my Zapotec and Otomi elders in Oaxaca and in Mexico City. These are indigenous people, two different tribes. And our foundation had a three-year-long vision of donating a crystal inlaid drum to our Otomi elder twin to support their amazing sustainability work down there. They marched against Monsanto.

And the way they do their work is with the drum and with songs and with prayers. And they do this daily. So we want to be part of that, supporting their amazing work. They have a sacred hill called Mount Moctezuma in the middle of Mexico City where this is the last refuge of the eagles. It's the last little sanctuary you can possibly imagine in a town of smog and toxic water. And I went through two weeks of diarrhea there because the bacteria

or the amount of bacteria in the water is so intense that my body could not really deal with it.

So why I am telling you this is because today in the morning, I flew back with Ravn, and I flew over this jewel from Anchorage, this amazing pristine land that's wild, that's pure, that has energy, that is the rawest in the entire North America and maybe in the entire world because where I come from, Austria, is a manicured, tamed land where the forests are groomed. So what we have here in Alaska is a one in a million kind, and we all need to protect this.

And when you talk about the murres dying, I want to add, please educate yourself on the contrails because to me this is the true reason why the birds are falling dead from the sky is because we get poisoned hour by hour with all the planes spraying. So, I just want to remind us all to focus that this can happen. One of the most amazing things that happened down there in Mexico City was that this Otomi elder started a petition with the government to plant trees. And so just in this year, 350,000 trees got planted by the government in the little district now called Parque in Mexico City. So if this is possible in a super toxic town like Mexico City, I say our land here in Homer with no fracking and no more gas and oil drilling is possible.

So please, let's keep the hope strong. And I want to say I am meditating every day to just focus on what I want. And all I am seeing in my intentions is we keep this pure land strong.

Thank you.

MR. MARK STORZER: No. 47.

MS. CARLA STANLEY: Hi. My name is Carla Stanley. I have been on the Peninsula since 1970 having arrived 46 years ago this week. I am a person whose feet have been deeply submerged in muds and sands and clays of Cook Inlet, and I have appreciated it from my first moments here.

I was a teacher at Kenai Junior High in the early '70s and taught marine science and first aid and certified 1,500 kids in Red Cross first aid as part of something that I truly believed in that had not been offered before. But I said you can't let kids get out without knowing how to take care of themselves.

It's funny how I believe that I felt then and believe now that prevention is the best medicine. And prepare kids, first of all, to be safe; secondly, to know how to take care of yourself if something bad happens.

When I retired from teaching in 1997, I went out cheering and saying, I'm moving south. And everybody says, where you headed? Florida? Arizona? I said, no, I'm going to Homer. My kids were born here in the early '70s, and Homer was always one of the places I loved the most. I spent a lot of time in Halibut Cove, met Clem Tillion back in 1972, have known his daughter Marian since she was a child caring for seals and sea lions, and have loved Kachemak Bay. Have loved fishing for crab off the spit, the end of the spit, having caught king crab and dungeness and everything else, and being able to throw a shrimp pot out and catching shrimp. I've seen it all go away for various reasons.

But that's all the more reason that we need to do everything in our power to prevent those accidents from happening.

I believe that we all know that Kachemak Bay is a critical habitat area. And those words mean a lot to me: Critical habitat. And that Kachemak Bay has been designated one very special site by the Western Hemisphere Shorebird Reserve Network because so many birds come here. Birds are our barometer of health of the oceans. The murres raised a big warning to us in this last year.

We have seen the largest amount of warm water pour into Alaska in this year than has ever occurred in recorded history. And I believe that sustainable energy is our only choice.

I am also Homer's representative to Cook Inlet

Regional Citizen's Advisory Council. In 1989 I was teaching and I had my summers free, although I was raising two boys. I -- when the Exxon Valdez occurred, I went right to Fish & Game and I said, I am willing to go anywhere, do anything I can to help meet this. I will volunteer to go anywhere and do anything. Well, they said they would be happy to have me, and they hired me.

My job was to go out on the drift boats, as our fellow fisherman did over here, and map the oil globs that floated up through the inlet. And I also was one of the head hunters when I wasn't out picking up oil globs, and I saw the millions and millions of salmon that hit the beaches.

Our inlet is very special in that all species -- all five species of salmon, Pacific salmon, come into Cook Inlet. It's one of the rare places that do. They go to all of these different rivers in the inlet. And their fry leaves the rivers and heads out to sea. The water that flows in Cook Inlet, as our display out here at Islands and Oceans shows, is one big ocean. It doesn't just go through those critical habitat areas. It goes all through the inlet and then spreads out through all of the waters in Kachemak Bay and throughout all the oceans of the world. We must protect the clean water that we have in every way we can. Let's support energy --

The last thing I wanted to say is in the last ten years as a member of Cook Inlet RCAC, I've heard every oil company that works in this inlet talk about how special and how good they are at preventing accidents. I also know the technical glitches, pilot error, although that does not happen often -- but technical error and nobody can predict what happens to them and their health at any moment in time. And it can cause the accidents that we all fear.

So I support no action, and let's protect what we have. Thank you.

MR. MARK STORZER: No. 43 is next.

MS. AMY CHRISTIANSEN: Hi. My name is Amy Christiansen. I have been a Homer resident most of my adult life. I came here in 1980 when I was 19 years old. I have been in love with this ocean for many years. I want to be a little more direct at your things. I wanted to say that all five species of salmon are in Cook Inlet, and all five species of salmon are not mentioned in your plan.

I also have to tell you that I often get confused if it's Bureau of Ocean Energy Management or is it Bureau of Oil Energy Management? Every time I see you guys, it's about oil. I have yet to see you come forward and say it's time for renewable energy, and we're here to bring it

and we're here to help you guys change your consumption to something that is not harmful.

There were several actions proposed, but I don't understand why only beluga whales are considered. Yes, they are threatened. Yes -- so you go back to this old science, but the thing is, things are threatened every day and more threatened and more -- the more people there are on this planet, the less animals there are on this planet. And your proposed EIS, which studies beluga whales which we know are endangered and sea otters which are threatened, does not include clams and salmon and mussels and things that for the last 30-some years I have been fortunate enough to eat from these oceans.

The Kenai Peninsula is a valuable, valuable place, not only for the people who live here, but to the people who play here. Our environment sustains us mentally, physically and emotionally. And it needs protection in every way possible.

I can't believe they are about to frack based on some oil sale that happened in 2014 right up the road, and they are going from land into the ocean, which isn't done very often. And we really don't have it studied up, but it will happen as soon as September or October. They are going to frack Cook Inlet. And once that frack occurs, you guys are just like, oh, yeah, we have done it before, we can do it again. We can be safe. I've heard that over and over again.

The Gulf of Mexico is a wasteland because of oil and gas. And nobody -- nobody holds clear to their promises that they can clean it up because you can't clean it up and you -- you show me that over and over and over again my entire adult life. I've heard oh, don't worry it's not going to happen here. I'm just tired of that.

You discuss species like belugas and sea otters, but you have not discussed one species of which I am a member, and that is man. And what you are about to do with these lease sales affects anyone that lives here, anyone that is sustained by this ocean.

And again, I agree with what Carla just said: The ocean is all connected. You can't just plot out things on a map and say, oh, we will leave you this part of this critical habitat. The tides here are the second or third largest tides in the world. Maybe there's different tides in Russia we don't know about, but that ocean washes up on the beach, washes out to the sea. And you can't tell me that same ocean washes up on that same beach. It's all related. And what you don't seem to understand is no matter what beach you set aside, that same water goes out and comes in.

So if you -- if you hurt what's outside of that area

you say you will leave out because it's critical habitat, you can't protect it. You can't control the tides.

We live and play here, and we are against this. And the only thing I can say is no development, no lease, none whatsoever. If you are going to lease something, then we better have the same chance to say each of your parts. I want the same opportunity to argue for whatever it is you guys come up with, the Bureau of Ocean -- I mean, Oil Energy Management.

MS. SURAJ HOLZWARTH: Thank you for being clear.

MS. AMY CHRISTIANSEN: What else was I going to say? I think that's good enough for now. You will hear more from me.

MS. SURAJ HOLZWARTH: A lot more.

MS. AMY CHRISTIANSEN: Wait, wait. One more question. Who is inspecting all the old ARCO types and tanks that are already under the ocean and across the inlet? ARCO abandoned us or went bankrupt, or whatever these oil companies do, but who is inspecting that and who is going to make sure that whatever they are going to do next is going to be inspected and up to standard? Because nobody is inspecting this stuff. And from what I hear from a pipe inspector, it's all about to leak. So I want to know, you BOEM guys, who is going to make sure that

whatever is put in place is inspected 30 years from now? Because nobody is taking care of the ARCO stuff that already exists.

Leave it in the ground. Leave it beneath our sea. We don't need this now. Whatever is there isn't new oil. We have known about it for years. Whatever is there belongs to our children and our grandchildren because maybe they'll need it, maybe they won't. But it is our job to leave it in the ground for future generations.

MR. MARK STORZER: No. 53, you will be next.

MS. JEANNE PARKER: My name is Jeanne Parker, and I have been here since '76. I was here in '76 when the George C. Ferris -- I think was the name -- got its leg stuck in Kachemak Bay, and luckily that caused a buyout -- or a restriction of no drilling in Kachemak Bay because people got to actually see what that was going to be like and the potential and the beauty of this bay.

I just want to reiterate that Cook Inlet is part of this whole system. And I'm already bothered daily and I -- I don't eat as much salmon as I would love to because of the discharge that already occurs in Cook Inlet, that drill rigs are already allowed to discharge more than other places. Why is that? Because there is more tide here? Well, where does it go? It goes somewhere.

And the whole setup of a hearing where you are, like, okay, these are the facts that we have studied and here is how you can say -- you know, here is the best way to give input, it's all very dry, and it's addressing something in a very old way that we need to change. We need to change --

We need to leave it in the ground. Information is coming out about the oil companies knowing that we need to leave it in the ground. And they knew that many, many years ago, and they buried that. So why should we trust an old process that allows things like that to happen and allows people to bury information, corporates to decide that, well, it's not in our best interest. And, you know, the whole money driven society is not -- the economy is based on something that's totally false.

So to be -- to be speaking to this process is kind of like, well, we are going to have to beat you, so where would you like to be hit. Would you prefer it in the foot? You know, oh, yeah, we realize you don't want to be stabbed in the heart, but maybe we could do it someplace else.

And it's given like it's a given fact that we have to keep extracting oil because we use it. And it's true we do use it, but the only way to stop using it is to stop extracting it.

So we need to start that process here in Alaska. Here in Alaska we are on the forefront of climate change. It's really noticeable. I wish everybody in the world that didn't believe in climate change could come to Alaska because it's -- you can't ignore it if you have a thinking mind or a feeling heart. And so anyway, no drilling is my alternative, and I hate to have all this stuff laid out as if, you know, like I said, can we hit you here, can we hit you there. Can we get this species? Can we spill this much? It doesn't make sense. It needs to turn around. And the only way to turn it around is to start right now and do it.

MR. MARK STORZER: You can draw the last number here, at least for now. No. 42.

MS. TAMARA MCSHANE: Hi. My name is Tamara McShane, and I've heard some wonderful things from everyone here. And I'm a Homer resident. And we have a zillion reasons environmentally why we shouldn't go ahead with this project.

But one thing that I'm not sure I've heard people mention is, what about us? What about us? Pretty soon we will be the endangered species. It's well documented that, you know, what it will do to our water tables. It's well documented that once ground is fracked and it connects into our already -- you know, like our -- what do

you call it -- all the faults that it's -- it's like a broken window. So the oil companies go in and they frack, and then -- and then once it connects in with that other fault line and it moves, it breaks like a broken window, and the earthquake dangers go up immensely. And these are things that we haven't thought about.

Other things that we need to think about, as well, are what's it going to do to our roads. We -- my husband and I had the opportunity to drive through Salt Lake last summer, and we drove out of Park City on our way to Colorado, and they have fracked the heck out of that place, and they have had one well after another drilled. And we thought we were going to have a one-hour trip, which turned into a four-hour trip. We were on little roads like we have here, two lanes. And we had one tanker after another after another after another.

So what we are going to have here is we are going to have 30 years of crap trying to drive from Homer to Soldotna. Many of us will die on those roads. We will have -- it will so greatly affect our lifestyle. So I like what I heard from Amy, that we can keep it in the ground for other generations. You know, save it. You know, we are going to need it later. They are going to need it later. So just save it, hang onto it, and leave our bay alone because not only is it going to affect all

of these people or all of these species and our environment, but we will all be an endangered species. So I'm definitely against it.

MR. MARK STORZER: So No. 42. No. 42. There may have been one person that --

MS. SHARON WARREN: That may have been yours.

MS. MARK STORZER: So does anybody else want to provide testimony? You? If you haven't signed in, when you are finished you can sign it. And then just say your name and spell it for Mary so she can get it down.

MR. ROBERT ARCHIBALD: Robert Archibald, A-R-C-H-I-B-A-L-D. I'll try and speak slowly.

So Minerals Management was the division that used to management offshore oil in the Continental Shelf, and after the Deep Water Horizon, it was replaced with BOEM. So you are tasked with quite a -- quite a job. And I thank you for coming here and speaking with us and letting us speak to you.

I came up to Alaska in 1965 on a supply boat for oil companies in Cook Inlet. I was a kid. I've seen the good, the bad, and the ugly. I was on the supply boat for the George Ferris. That was ugly. I've worked in Cook Inlet, and the last 22 years I've worked over in Prince

William Sound on escort tugs.

I have to say that developing an oil field in Lower Cook Inlet is going to present some challenges. I don't like them. To begin with, you are going to have seismic activity. As we saw in these movies several weeks ago, seismic activity, three-day seismic activity is detrimental to any marine life. Ten-mile buffer zone is not enough. And who is to say that a whale is going to stay in a ten-mile buffer zone. The dates are completely wrong.

So you are in a noisy environment to begin with that these guys have developed since this. To endure that natural noise and when you throw that on top of them, lord knows what's happening.

So that next step would be exploration where you bring in exploration rigs. You would either bring in floating rigs or jack-up rigs. We have seen what's happened with the jack-up rig. It's fallen down. Well, it got stuck in the mud. It may not happen again. I think these people are a little smarter than that.

But since I've worked in Cook Inlet, I've seen three blowouts. The first one was up on the Forelands, the North Foreland, and it burnt all winter. The next one was on a platform in Cook Inlet. And it didn't catch fire, but it made a mess. The next one caught fire, and it

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54

almost destroyed the rig. So when you say that there is nothing that's going to happen, it can happen any time.

Production, if they go into production, it's going to be a fixed platform type operation. It's not just going to be a platform; there's going to be the infrastructure to go with it. You're talking pipelines. You are talking ships. You are talking tanker traffic. Cook Inlet does not have a vessel traffic system. So if you increase the tanker traffic, you are going to increase that problem.

You know, to throw this on top of our community right now after our meeting with the Navy almost seems a little cruel to me because we are dealing with die-offs that nobody can really understand. And I don't think we are really ready to go there.

We have been enduring drilling fluids from Cook Inlet since the inception of the oil industry in Cook Inlet. And nobody can really say why we are losing our marine mammals and the marine life in Cook Inlet. There is a lot of thoughts, but no answers.

So I don't think option or Alternative 1 is at all tolerable. I'm certainly in favor of option or Alternative 2, there is no drilling. But in the event that something does happen and they go ahead with this drilling, I think all the rest of the options should be enforced. I think that it should be protected to the

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55

maximum.

And I guess that's about all I have to say. Thank you.

MR. MARK STORZER: State your name and spell it for Mary, please.

MS. RIKA MOUW: My name is Rika Mouw. R-I-K-A M-O-U-W. Thank you, Robert. You addressed some of the things I wanted to address. I agree with everything that was said before and times ten, a thousand. I would like the no action alternative.

I want to touch on climate change, sound pollution, ocean acidification, just the development exploration phase. I think that is a spill in itself. The airplane traffic -- I just noticed the second page. The flights per week during development, during exploration, during production, the dozens and dozens of flights, boat trips, pipelines, all of that is probably using as much energy as you are going to get out of this whole exploration.

And that is -- I'd like that to be quantified, and I don't think that is in the EIS. I don't know. I haven't read it thoroughly, but I would like that to be addressed as what kind of energy does it take to actually get to the point of production. And what are the benefits of that? How much ahead are you going to be?

And I know that our harbor here in Homer is just

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56

itching to expand, to be the center place for the industry, and that is a carbon footprint in itself. And we are just using a tremendous amount of energy to get the energy. And I don't ever see that being part of the calculation.

Ocean acidification is so horrendous, and we are not -- it's not something visible. It's not something that you can feel or see, but it is happening today, and it will only get worse. And all of this that we are talking about is all cumulative. I don't see that being addressed. It's just about -- you know, it's just these things about endangered species and the otters and all that. That's sort of like the megafauna. That's the easy stuff to see.

And the cumulative effect -- I mean, this planet, the thin skin of life now is so fragile now that it takes less and less for it to lose that balance.

And I don't want to take a lot of time. I just want to stay I don't want to see our harbor expand for industry. That's the wrong direction. And that's what they are craving.

And I -- we need to keep the oil in the ground, not for anything. It just needs to stay in the ground. That's not an alternative. It's not for the future. It's not anything. We need to stop thinking about our lives

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57

today. There is a future for future generations and for other beings. And I agree with -- I forgot your name.

MS. SURAJ HOLZWARTH: White Eagle.

MS. RIKA MOUW: -- that we, the people, includes all living beings, all living beings. And it's just time to stop the fossil fuel consumption. It's just -- there is no excuse for it anymore.

Thank you very much.

MR. MARK STORZER: I do want to, you know, really thank everybody who came tonight. Obviously there is a lot of passion. I know it's not always the most exciting thing to do, but I personally -- and I can speak for the rest of the staff that's here. We do appreciate it, and we do hear what you are saying. And like I said, we will use this information to inform the decisionmakers who actually decide whether or not there is a lease sale.

So I appreciate your time. We are going to take a break, give Mary a little bit of a break. If anybody else wants to testify, let us know, and we will open it back up after a while and just see if there is anybody else that wants to testify.

But you know, one thing that I -- that I would recommend, folks, if you are interested and want to take the time, all of the comments that we receive as an agency are in and will be in the final EIS. And it's very

MIDNIGHT SUN COURT REPORTERS (907) 258-7100

58

interesting reading to see all the comments from the citizens and the local governments, from the state representatives, from the federal representatives. There is a lot of people that comment on these processes.

So it's very interesting to read through those comments because they are all out there and they are all in the final EIS. And they are actually up on regs.gov right now, anything that's been submitted. It's a public website. Go through it. You can read it and you can see what everybody is saying about the lease -- the proposed lease sale. So I appreciate your time.

MR. BOB SHAVELSON: Can I make a couple comments now because I think everybody is going to leave after you take break because it's a nice night out here.

MR. MARK STORZER: Yeah, you can go ahead and testify again, Bob. And then after Bob, we will take a break because I know Mary --

MR. BOB SHAVELSON: I'm not trying to keep people in here on a nice night, but I was really motivated by a lot of the comments I heard. Just a couple things I want to say. First of all -- anyway, I'm representing over 2,000 of Cook Inletkeepers' members and supporters up here. I forgot to mention that. But you know, the talk about climate can seem so distant, and I think a lot of what we heard is very personal here, and we

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59

see these changes here.

But I took my family over to a set net fishing site, a commercial site over on Chisik Island this summer, and we were over there when the Tekla, the maritime refuge research vessel, came over with some bird biologists. And it's incredibly beautiful over there. And these populations of murres and puffins and kittiwakes are just -- they darken the sky.

And as we talked to the biologists they said to us, the birds aren't nesting and we have never seen that before. And there is tens of thousands of birds. And it's part of our maritime refuge. And so they are not nesting. They are not laying eggs. And that's monumental. And that's just one piece of the puzzle.

As we started to talk to more people coming through -- we were talking to set net fishermen and we were talking to drift fishermen, and their catches were so low this year. And, you know, fishing goes up and down. We understand that. But the fish weren't getting into the rivers. And the fishermen I talked to said the fish were staying deeper to be in the colder water. They're staying offshore away from the set nets. They're staying deeper to go below the drift nets. So these are some of the implications that are affecting us personally and are right here.

MIDNIGHT SUN COURT REPORTERS (907) 258-7100

60

Just to provide a little bit of context, Cook Inlet is the birthplace of commercial oil and gas. In 1957 a guy named Bill Bishop, an arctic geologist, put his boot down in what's now the Kenai National Wildlife Refuge and said, drill here. We did. And oil and gas development proceeded apace. And very quickly after that we had development offshore. And a lot of this development predated the passage of our major environmental statutes: The Clean Water Act and the Clean Air Act. And because of that, Cook Inlet, in my opinion, is somewhat of a regulatory backwater. We don't have the same compliance things that we do elsewhere.

And Robert talked about shipping. We don't have tug escorts for laden tankers, for example, in Cook Inlet. Over in Prince William Sound you have got two tug escorts tethered to a laden tanker. When they are transiting oil in Cook Inlet, it's kind of the wild west. And another great example is the produced water, the water that comes up from the reservoir in the production of oil and gas, is just dumped into the inlet. And right now that volume is about two billion gallons a year. And that's the only coastal water body in the United States where that's allowed.

So it's -- again, it's kind of a wild west mentality here, not to say that that would occur in the federal

MIDNIGHT SUN COURT REPORTERS (907) 258-7100

61

waters, but that's the mindset that we have here.

And when I look at how oil and gas has affected our state, it's been so profound. And most recently we've seen it in our legislative process. We have seen our PFD get reduced, but we have seen these enormous -- hundreds of millions of dollars in tax credits sustained for the oil and gas corporations, some of the richest corporations on the entire planet. And so we recognize that these corporations and their lobbyists have an incredible hold over our people and our politicians.

And we don't have to look any further than the election we just had yesterday. And we saw some outside money coming from ConocoPhillips and other oil interests conduct one of the ugliest campaigns that we have ever seen here with smears and allegations that are unfitting of our democracy. And fortunately, people prevailed and a person that stood up to the oil companies and representing Alaskans prevailed, but I think we got lucky.

Just a couple more things. Robert talked about the -- you know, the infrastructure. And if you go back to the 1970s when we were starting to look for oil and gas here, there was a program called the Outer Continental Shelf Environmental Assessment Program. And it was interesting because it was really the first time we started to look at some of the incredible natural

MIDNIGHT SUN COURT REPORTERS (907) 258-7100

62

resources that we have in Cook Inlet. And they came out with these large format books that we have still got several of. And they are just interesting.

The format they are presented in -- one of the pages always sits with me, and it's the infrastructure -- it's a map of the infrastructure if we industrialize Lower Cook Inlet. And it's literally a spider web of pipelines and tanker routes and tank farms and refineries. And imagine the Homer Spit that looks like Nikiski. And that's what that image prevails. And you would have no other choice but to develop Lower Cook Inlet in that way because you have to bring the product to market.

One of the things that I did -- I talked about the process early on, the public process here and some of the failings I saw in it. But the public notice came out here in the middle of July when, you know, everybody is fishing and out enjoying the summer. And we are closing the public comment period on September 6. And I put in a request that there be an extension for two months on that so more people have an opportunity. So I'd encourage people to ask BOEM to simply give us a little more time.

I mean, the price of oil is very low here. I don't think you are going to have any oil companies banging on the door to lease it. I think it's a great opportunity to have Alaskans have more time to voice their comments.

MIDNIGHT SUN COURT REPORTERS (907) 258-7100

63

One more thing I'd just add. We talk a lot about the process. And I don't like to come out to a public hearing. I don't think anybody likes to come out and hear a rote machine talk through a PowerPoint and we can't answer questions and we go through this and then a document comes out and we respond to comments. And it's so impersonal, but the permitting process is called a permitting process for one reason: It issues permits. And development is presumed. Okay.

We are asked -- you know, not -- the important question that we are always asked is, how should we do this development, not whether we should do this development; and to me, that's really the critical question. And just on the grounds of climate I think the answer is clear in this case.

So with that I'd just say thank you. Sorry to extend it too much, but I appreciate the opportunity.

MS. SURAJ HOLZWARTH: I have just a couple of things to say. First off, I want to make sure that I said absolutely no to any oil and gas development in Cook Inlet. I just didn't know if my speech had that in it.

Secondly, I want to say I don't understand -- you know, I am a mixed blood Native American, and sometimes I feel so out of the loop in the way this consciousness

MIDNIGHT SUN COURT REPORTERS (907) 258-7100

64

thinks. To compartmentalize and say these waters over here will not affect these waters over here is nothing that a Native American can understand. There is nothing that is not connected. Everything is interconnected. I scoop up water in my hand, and there is billions of -- of life forms in my hand.

So this idea of this is going to be safe is such a ridiculous concept and so spiritually, emotionally, mentally uneducated and not how the whole universe operates as a synergy. It always has been an ecosystem. It always will be an ecosystem. The entire universe operates at a synergy. So to say, well, we can just do this here and it doesn't affect -- or, as my beautiful sister said, should I get hit in the leg or should I get, you know, beaten here, there is just absolutely no other choice.

And I want to correct you, sir. I totally respect and I thank you so much for being here out of your time. But to say that you will take our word to the powers that be, we are the powers that be, not you and not those people up there. That's a top down consciousness that we are done with in this country and around the world. It's we, the people. It is not who has the most money. And if you are worried because we can't beat the oil companies because 60 people own this planet at this time, if that's

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65

what you are believing, then you are going to go down with the ship because the only way out of this top down consciousness is for us to unify.

So my vote tonight is that we get each other's names and our organizations become mobilized because our lives are at stake. It's not about you asking us permission whether it's -- it's going to happen. It ain't happening in our backyard. And if you want it to happen in your backyard, I'll put a rig in your house and in your backyard with your children.

So I am -- that's where I'm at. I'm not in this, oh, you know, that's nice, you are going to take our words. We are the people. The oil companies aren't the people. We are the people. And it's our land and it's our children and it's our we, the people. And across the world there are many groups rising in huge numbers against their governments to take back their democracy and to start from the grassroots that we can live sustainably from Homer, not from importing and exporting oil from our lands.

And I just want to make sure I said at least three times no oil and gas will happen on this land.

Thank you very much.

MS. DEBORAH LIMACHER: I just wanted you to realize that I have been working a lot with Bluecrest

Energy, the Cosmopolitan unit up here at Stariski Creek where they are intending to frack. And I just wanted to say when you give out these leases and these companies go for the permitting, to my knowledge -- and I'm sure Bob would know more than me -- these folks are not yet -- their permitting was for an oil rig, offshore oil rig. They have not gotten the permitting yet for the fracking, but yet they already are bringing in everything it takes to start fracking. And yet they don't even have the permit yet for fracking. And as far as my knowledge, I don't think --

Bob, do they need to actually get an extra fracking permit? I thought you said they did.

MR. BOB SHAVELSON: That's state versus federal, but it's a separate permit for the fracking on state lands.

MS. DEBORAH LIMACHER: All right. So whoever would lease these permits here would have to go through federal rather than state permits with you folks?

MR. BOB SHAVELSON: Yes.

MS. DEBORAH LIMACHER: Okay. So then would you require an extra permit for that, for fracking on these leases?

MR. MARK STORZER: That's well beyond the leasing stage. So yeah, there is a process involved with

that.

MS. DEBORAH LIMACHER: Well, just consider it because it's happening right here in front of us without us even knowing.

UNIDENTIFIED FEMALE SPEAKER: And fracking is standard operating procedure for all oil companies.

MR. MARK STORZER: One last comment, then we'll take a break.

MS. DURA COEN: My name is Dura Coen. Another thing we didn't consider for the statement, I think when they drill, it brings up radiation and it gets into the ocean and the waters, as happens on the Slope, I know. So it could get into our drinking water and stuff. And it's not tested for it, the drinking water. At least it wasn't up on the Slope. You could hear them talking on the radio on the Slope about where the radiation -- we don't know where the radiation is coming from and they are drilling for, you know, whatever they are drilling for down there. So it's something else to consider here in the Inlet. All this radiation from the drilling and nobody monitors it and it would get into our waters and our fish.

MS. SURAJ HOLZWARTH: Sounds like a great plan.

MR. MARK STORZER: As I said, I appreciate

it. This isn't your last chance. Submit comments on line, and they will be looked at. Like I said, we will be around for a little while yet. If somebody else wants to testify, let us know, and we will open the record back up.

(Off the record.)

(Proceedings adjourned at 7:45 p.m.)

REPORTER'S CERTIFICATE

I, MARY A. VAVRIK, RMR, Notary Public in and for the State of Alaska do hereby certify:

That the foregoing proceedings were taken before me at the time and place herein set forth; that the proceedings were reported stenographically by me and later transcribed under my direction by computer transcription; that the foregoing is a true record of the proceedings taken at that time; and that I am not a party to nor have I any interest in the outcome of the action herein contained.

IN WITNESS WHEREOF, I have hereunto subscribed my hand and affixed my seal this 31st day of August 2016.

MARY A. VAVRIK,
Registered Merit Reporter
Notary Public for Alaska

My Commission Expires: November 5, 2016

OFFICIAL SEAL
STATE OF ALASKA
NOTARY PUBLIC
MARY A. VAVRIK

INDEX

[

A

B

C

D

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APPENDIX F – Section 3

Comment Letters

Federal Government

Tribal Governments

State Government

Local Government

Citizen Advisory Councils

Environmental Non-Governmental Organizations

Industry Non-Governmental Organizations

Fishing Organizations

General Public

Federal Government

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue, Suite 900
Seattle, WA 98101-3140

OFFICE OF
ENVIRONMENTAL REVIEW
AND ASSESSMENT

August 15, 2016

Dr. James Kendall, Director
Bureau of Ocean Energy Management, Alaska OCS Region
3801 Centerpoint Drive, Suite 500
Anchorage, Alaska 99503–5823

Dear Dr. Kendall:

Thank you for the opportunity to provide comments on the Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244 Draft Environmental Impact Statement, in Cook Inlet, Alaska (EPA Project Number 14-0060-DOI). We have conducted our review in accordance with our responsibilities under National Environmental Policy Act and Section 309 of the Clean Air Act.

Based on our review, we have assigned a rating of EC-2 (Environmental Concerns-Insufficient Information) to the EIS. This rating is based primarily on concerns relating to potential impacts to water quality, areas of special concern, tribal and environmental justice populations, birds, and endangered species, specifically relating to a large scale oil spill. While we recognize that the probability of a large scale oil spill is low, we continue to encourage the BOEM to develop additional precautionary and response procedures, in consultation with other Federal, State, municipal, tribal and public-at-large stakeholders, to ensure coordinated efforts into the future, especially if actual projects are developed under this lease sale. For your reference, a copy of the rating system we use to conduct our review is enclosed.

Overall, we believe that the Draft EIS does a satisfactory job of analyzing a range of reasonable alternatives for the potential leasing scenarios for the Cook Inlet Planning Area, as well as beneficial and adverse impacts associated with the alternatives. We believe each of the action alternatives provides additional protections, as compared to the previous lease sales through the avoidance of most critical habitat and other sensitive areas. As such, we do not object to the selection of any of the action alternatives or combination of alternatives. We also fully support the rigorous monitoring strategy that has been proposed by the Bureau of Ocean Energy Management, and further NEPA evaluation of any actual proposed project. We recognize incorporating such information into future management decisions will ensure that accurate and effective management strategies are being employed.

We continue to support the evaluation of a very large oil spill scenario in lease sale EISs and appreciate this has been completed for this EIS. We believe doing so will assist spill response entities, as well as potentially affected communities to better prepare for such a low probability but potentially high impact event. We believe this preparation will also further minimize those moderate to major impacts identified above.

We also commend the BOEM for extensive stakeholder and tribal outreach and communication to date. We believe continuous communication, particularly with those who are dependent on the marine resources of the lower Cook Inlet, will allow the BOEM to incorporate additional mitigation or monitoring to ensure concerns are addressed.

Enclosed are several specific comments for your consideration as you prepare the Final EIS. We ask that the BOEM incorporate these comments, particularly those associated with the EPA's authorities and existing applicable permits, in the Final EIS.

Finally, we note that the Council on Environmental Quality recently finalized guidance regarding the analysis of greenhouse gas emissions and climate change in NEPA documents.[1] We recommend that the BOEM utilize this guidance in the discussion regarding GHGs and climate change in the Final EIS.

Thank you for the opportunity to review this Draft EIS. If you have questions about our comments, please contact me at (206) 553-1601 or littleton.christine@epa.gov or you may contact Jennifer Curtis of my staff in Anchorage at (907) 271-6324 or curtis.jennifer@epa.gov.

Sincerely,

Christine B. Littleton, Manager
Office of Environmental Review and Assessment

Enclosures:
1. U.S. Environmental Protection Agency
   Comments On The Bureau Of Ocean Energy Management Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244
   Draft Environmental Impact Statement
2. U.S. Environmental Protection Agency Rating System For Draft Environmental Impact Statements

[1] https://www.whitehouse.gov/sites/whitehouse.gov/files/documents/nepa_final_ghg_guidance.pdf

2

ENCLOSURE 1

U.S. ENVIRONMENTAL PROTECTION AGENCY
COMMENTS ON THE BUREAU OF OCEAN ENERGY MANAGEMENT
COOK INLET OUTER CONTINENTAL SHELF OIL AND GAS LEASE SALE 244
DRAFT ENVIRONMENTAL IMPACT STATEMENT

Oil Spill Analysis
We commend the BOEM for the inclusion of oil spill analysis for a range of spill sizes, including a very large oil spill, and believe this analysis is critical in the development of adequate spill planning and response activities. As stated previously, we recognize that the probability of a large scale oil spill is low, particularly given the likely level of activity anticipated under this lease sale, and impacts will be mitigated in large part through the proposed exclusion zones, information to lessees and stipulations. Nevertheless, the potential for major impacts from a large scale event exists, especially impacts to certain resources and populations (water quality, areas of special concern, tribal and environmental justice populations, birds, and endangered species). As such, we continue to encourage the BOEM to develop additional procedures, in consultation with other Federal, State, municipal, tribal and public-at-large stakeholders, to ensure coordinated efforts into the future. This will be essential should an actual project or projects be developed under this lease sale.

Specific Comments
We offer the following comments for your consideration in the Final EIS:

Page ES-3, 3rd paragraph, we recommend the identification of a number of years for the "lifespan" given that risks generally increase with facility age.

Page 2-13, 2nd paragraph, Section 2.1.1 says "The Proposed Action would offer for lease 224 OCS blocks in the northern portion of the Cook Inlet Planning Area" and Section 1.3.1 on page 1-7 states "A lessee must submit a detailed Development and Production Plan (DPP) that BOEM must review under NEPA". It is unclear how a lease sale EIS determines the requirements for a part of the process where no plan has been submitted. We recommend that additional information be included on this subject.

Page 2-14, 1st paragraph, we note that AKG-31-5000 did not prohibit drilling discharges from new facilities but ***only covered*** development and production facilities that did not discharge these substances (similar to how AKG-28-5100 only covers exploration activities). Development and production facilities can apply for an individual permit, and like BOEM DPPs, would be subject to NEPA analysis. EPA's regulations allow the discharge of drilling fluids and cuttings in the OCS. This is also important to consider given the discharge prohibitions outlined in Alternative 6.

Page 3-19, 2nd paragraph, we note that while the water quality standards can be considered another measure, the requirements of 18 AAC 70 do not apply in the federal waters of Cook Inlet.

Page 3-20, 3rd paragraph seems to indicate that two-thirds of the population of Alaska lives in Anchorage when the actual population numbers (AK Department of Labor and Workforce Development website) show that this is the population of the entire Cook Inlet watershed. We recommend that this be corrected.

3

Page 3-20 3rd paragraph, we note that currently there are no large-scale coal mining operations for coal in the Cook Inlet watershed. A proposal for one project, Chuitna Coal Mine, is currently being evaluated, but a Draft EIS has yet to be published.

Page 4-29, 1st paragraph, we note that the draft Ocean Discharge Criterion Evaluation was included with the public notice for the National Pollutant Discharge Elimination System General Permit in 2013 but the final GP was released in August 2015 when the final permit was noticed in the Federal Register (August 5, 2015).

Page 4-29, 1st paragraph, we note that facilities could apply for an NPDES permit to discharge drilling muds and cuttings.

Page 4-30, 3rd paragraph, please change to "…the appropriate effluent limitation requirements listed in the Cook Inlet Exploration General Permit."

Page 4-30, 4th paragraph please change to "Vessels <24 m (79 ft.) in length that are operating as a means of transportation may be covered under the VGP, or may instead opt for coverage under the small VGP (sVGP) issued by the EPA."

4

ENCLOSURE 2
U.S. Environmental Protection Agency Rating System
For Draft Environmental Impact Statements

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

Environmental Impact of the Action

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

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

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

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

Adequacy of the Impact Statement

Category 1 – Adequate
EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis of data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category 2 – Insufficient Information
The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses or discussion should be included in the final EIS.

Category 3 – Inadequate
EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the National Environmental Policy Act and or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

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

PUBLIC SUBMISSION

As of: September 07, 2016
Received: September 06, 2016
Status: Posted
Posted: September 06, 2016
Tracking No. 1k0-8rr4-3y54
Comments Due: September 06, 2016
Submission Type: Web

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0071
Comment from Rebecca Lent, Marine Mammal Commission

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Organization: Marine Mammal Commission
Government Agency Type: Federal
Government Agency: MMC

General Comment

The attached comment is from the Marine Mammal Commission in response to the BOEM Notice referencing the Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244.

Attachments

16-09-06, Rolland, BOEM DEIS for Cook Inlet Lease Sale 244

MARINE MAMMAL COMMISSION

6 September 2016

Mr. Michael Rolland
Chief, Leasing Section
Bureau of Ocean Energy Management
Alaska Outer Continental Shelf Region
3801 Centerpoint Drive, Suite 500
Anchorage, Alaska 99503-5823

Dear Mr. Rolland:

The Marine Mammal Commission (the Commission), in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed the Bureau of Ocean Energy Management's (BOEM) draft environmental impact statement (EIS) for Lease Sale 244 within the Cook Inlet planning area and associated notice of availability (81 Fed. Reg. 47819). The Commission commented previously on BOEM's notice of intent to prepare an EIS and request for interest concerning a proposed special-interest lease sale within the Cook Inlet planning area (see the Commission's letters dated 8 December 2014 and 7 May 2012). In those letters, the Commission recommended that BOEM defer the proposed lease sale until such time that it could, with reasonable confidence, confirm that the lease sale was not likely to jeopardize the survival or recovery of the Cook Inlet beluga whale population. The Commission further recommended that if BOEM decided to conduct the lease sale, it be restricted to areas south of Anchor Point.

The draft EIS identified six alternatives. Alternative 1 (the proposed action) would offer for sale all 224 Outer Continental Shelf (OCS) lease blocks identified in the lease area with no additional mitigation measures. Alternative 2 would not allow for a lease sale to occur. The remaining alternatives would provide explicit or ancillary protections for marine mammals and their habitats. They are as follows–

- Alternative 3A would exclude from the lease sale portions of Outer Continental Shelf (OCS) blocks that overlap with beluga whale critical habitat.
- Alternative 3B would prohibit on-lease seismic surveys and exploratory drilling activities from occurring within OCS blocks that overlap with areas designated as beluga whale critical habitat between 1 November and 1 April, when beluga whales are most likely to be present.
- Alternative 3C would prohibit on-lease seismic surveys and exploratory drilling activities from occurring within any OCS blocks included in the lease sale between 1 November and 1 April, and would prohibit on-lease seismic surveys from occurring within OCS blocks located wholly or partially within 10 miles of major anadromous streams (which serve as potential feeding areas for beluga whales) between 1 July and 30 September.
- Alternative 4A would exclude from the lease sale portions of OCS blocks that overlap with sea otter critical habitat.

- Alternative 4B would prohibit lessees from discharging drilling fluids and cuttings and conducting seafloor disturbing activities (including anchoring and placement of bottom-founded structures) within 1,000 m of areas designated as northern sea otter critical habitat.
- Alternative 5 would prohibit lessees from conducting on-lease seismic surveys during the drift gillnetting season (approximately mid-June to mid-August).
- Alternative 6 would prohibit lessees from discharging drilling fluid and cuttings into Cook Inlet.

Lessees may request a waiver from the prohibitions imposed by Alternatives 3B, 3C, 4B, and 5 at the time of filing an exploration plan, provided that lessees propose an alternate method for protecting these areas.

The proposed lease area overlaps with designated critical habitat for endangered Cook Inlet beluga whales. There is no evidence that the beluga whale population in Cook Inlet is recovering, and the National Marine Fisheries Service (NMFS) has yet to determine the reasons for its continued lack of recovery (NMFS 2015). NMFS has identified the Cook Inlet beluga whale as a "Species in the Spotlight" due to its status as one of eight marine species most at risk of extinction in the near future. Assessing and managing the effects of human-caused noise in Cook Inlet, including noise from oil and gas-related activities, has been identified as a top priority for the conservation and recovery of Cook Inlet beluga whales (NMFS 2016). For these and other reasons outlined in previous Commission letters regarding lease sales in Cook Inlet, the Commission continues to recommend that BOEM defer the proposed lease sale (Alternative 2) as the only way to ensure that oil and gas activities would not jeopardize the survival or recovery of the Cook Inlet beluga whale population.

If BOEM decides to go forward with a lease sale in Cook Inlet, despite the potential risks to beluga whales, measures should be taken to provide the greatest safeguards for the beluga whale population. Those safeguards should include an exclusion of critical habitat areas from the lease sale and year-round restrictions on all seismic surveys and exploratory drilling operations north of Anchor Point. Although beluga whales are distributed primarily in the northern portion of the inlet (Shelden et al. 2016), opportunistic sightings indicate that beluga whales continue to inhabit lower inlet waters (south of Kalgin Island) at various times during the year (Owl Ridge Natural Resource Consultants 2014, McGuire et al. 2014). These areas warrant protective measures to ensure that beluga whales that are present are not disturbed by oil and gas exploration or longer-term development activities. Of the alternatives identified in the draft EIS, the most protective approach would be to combine the lease sale exclusions identified in Alternative 3A with the additional mitigation measures for all remaining areas identified in Alternative 3C. The exclusion of beluga whale critical habitat from the lease sale would ensure that no exploration or development activities occur in these areas in the immediate future. This would allow additional time to investigate the factors impeding beluga whale recovery. The prohibition on seismic surveys and exploratory drilling in areas and at times when beluga whales are most likely to be present would also prevent disturbance. Therefore, should BOEM choose not to adopt Alternative 2 but rather proceed with the proposed lease sale, the Commission recommends that BOEM include a combination of the lease sale exclusions of Alternative 3A with the mitigation measures for the remaining areas identified in Alternative 3C in the final EIS and lease sale.

Mr. Michael Rolland
6 September 2016
Page 3

Protective measures for northern sea otters also have been identified in the draft EIS under Alternatives 4A and 4B. As noted in the draft EIS, northern sea otters are sensitive to disturbance from vessel activity. They are also sensitive to actions that affect the primary constituent elements of critical habitat, such as the kelp forests used by otters for resting and foraging and also prey resources within such areas. Again, a combined approach would be more protective, i.e., a combination of the lease sale exclusions of Alternative 4A with the mitigation measures for the remaining areas identified in Alternative 4B. Therefore, the Commission recommends that BOEM combine the lease sale exclusions of Alternative 4A with the mitigation measures for the remaining areas identified in Alternative 4B in the final EIS and lease sale.

The Commission further recommends the inclusion of Alternatives 5 and 6 in the final EIS and lease sale, as they would have additional benefits for beluga whales, sea otters, and other marine mammals and their habitat in Cook Inlet.

I trust these comments will be helpful. Please let me know if you have any questions.

Sincerely,

Rebecca J. Lent

Rebecca J. Lent, Ph.D.
Executive Director

Enclosure

cc: Jon Kurland, NMFS Alaska Regional Office
Donna Wieting, NMFS Office of Protected Resources

References

McGuire, T., A. Stephens, and L. Bisson. 2014. Photo-identification of Cook Inlet beluga whales in the waters of the Kenai Peninsula Borough, Alaska. Final Report of Field Activities and Belugas Identified 2011-2013. Report prepared by LGL Alaska Research Associates, Inc., Anchorage, Alaska, for the Kenai Peninsula Borough, 178 pages.

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Mr. Michael Rolland
6 September 2016
Page 4

aerial surveys (1977-2012), opportunistic sightings (1975-2014), and satellite tagging (1999-2003) in Cook Inlet, Alaska. Marine Fisheries Review 77(2):1-31.

PUBLIC SUBMISSION

As of: September 07, 2016
Received: September 06, 2016
Status: Posted
Posted: September 06, 2016
Tracking No. 1k0-8rr9-y60w
Comments Due: September 06, 2016
Submission Type: Web

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0076
Comment from NOAA Fisheries, NA

Submitter Information

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General Comment

See attached letter.

Attachments

LS244 DEIS comments final 9-2-2016

BOEM-2014-0001-0076.html[9/7/2016 8:45:58 AM]

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
P.O. Box 21668
Juneau, Alaska 99802-1668

September 2, 2016

James Kendall, Ph.D.
Regional Director
Bureau of Ocean Energy Management
Alaska OCS Region
3801 Centerpoint Drive, Suite 500
Anchorage, AK 99503-5823

Dear Dr. Kendall:

The National Marine Fisheries Service (NMFS) has reviewed the Bureau of Ocean Energy Management's (BOEM) draft environmental impact statement (DEIS) regarding proposed oil and gas Lease Sale (LS) 244 in the Cook Inlet Program Area in the Outer Continental Shelf (OCS) Alaska Region. NMFS offers the following comments.

The area proposed for leasing under LS 244 is rich with marine mammals under the jurisdiction of NMFS, many of which are protected under the Endangered Species Act (ESA). Of particular concern to NMFS is the Cook Inlet Distinct Population Segment of the beluga whale, which is listed as endangered under the ESA. Ten potential lease blocks for LS 244 are located in waters designated as Critical Habitat for the Cook Inlet beluga whale, and beluga whales may occur throughout the lease sale area. NMFS recommends that BOEM choose alternatives that mitigate impacts to beluga whales and their critical habitat.

Specifically, NMFS recommends that BOEM choose a combination of Alternatives 3A and 3C as the preferred alternative in the final EIS. Alternative 3A will ensure that no exploration, development, or production will occur in the 10 lease blocks (2.68% of the proposed lease sale area) that overlap with beluga whale critical habitat. Alternative 3C prohibits on-lease marine seismic surveys occurring in any of the 224 proposed lease blocks between November 1 and April 1; a period of time when belugas are most likely to be present within portions of the proposed lease sale area that is not within Cook Inlet beluga whale critical habitat. Additionally, Alternative 3C prohibits on-lease marine seismic surveys between July 1 and September 30 for the 146 lease blocks that are within 10 miles of major anadromous streams. This provision would help enhance unrestricted passage of belugas within and between critical habitat areas, and minimize impacts on their anadromous primary prey species, both of which are essential features of Cook Inlet beluga whale critical habitat. Alternative 3C also protects other marine mammals that seasonally use lower Cook Inlet and feed near river mouths.

Finally on this point, we suggest that BOEM consider restructuring the alternatives for the final EIS to reflect more clearly that Alternatives 3A through 6 as described in the DEIS are a range of mitigation options that may be selected in any combination as the preferred alternative. The draft EIS may leave readers with the impression that these alternatives are mutually exclusive, which we gather is not BOEM's intent.
We recommend adding language about the Marine Mammal Protection Act (MMPA) and requirements regarding incidental take authorizations. The MMPA prohibits the unauthorized "take" of marine mammals by any person or vessel within the waters of the U.S. (16 United States Code (U.S.C.) § 1372 (102)(a)). Sections 101(a)(5)(A) and (D) of the MMPA (16 U.S.C. § 1361 et seq.) direct the Secretary of Commerce to allow, upon request, the incidental, but not intentional taking of small numbers of marine

ALASKA REGION - www.alaskafisheries.noaa.gov mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region, if certain findings are made and either regulations are issued or, if the taking is limited to harassment, a notice of proposed authorization is provided to the public for review. For example, a disruption of marine mammal migratory behavior, feeding, or nursing activities, perhaps resulting in cessation of the activity or separation of cow/calf pairs, would constitute an incidental taking. Authorization for incidental takings shall be granted if:

- NMFS finds that the taking will have a negligible impact on the species or stock(s);
- NMFS finds that the taking will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses (where relevant); and
- the permissible methods of taking and requirements pertaining to the mitigation, monitoring, and reporting of such takings are set forth.

Because of the likelihood that early lease activities could result in the "take" of marine mammals, MMPA incidental take authorizations would be required to avoid the unauthorized take of marine mammals. Therefore, we recommend adding language about this requirement in Chapter 6 of the final EIS (or another section where it may be deemed more appropriate).

On August 4, 2016, NOAA released Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (available online at: http://www.nmfs.noaa.gov/pr/acoustics/Acoustic%20Guidance%20Files/opr-55_acoustic_guidance_tech_memo.pdf). The Technical Guidance provides acoustic thresholds for onset of permanent threshold shift (PTS) and temporary threshold shift (TTS) in marine mammal hearing for all sound sources. It is intended to be used by NOAA analysts and managers, other Federal agencies, and other relevant user groups/stakeholders to better predict how a marine mammal's hearing will respond to sound exposure. Please update the final EIS to include this new acoustic guidance and in any subsequent analyses related to LS 244.

Lastly, Section 4.3.6 (page 4-73), states: "The Proposed Action does not entail leasing of designated critical habitat areas for the beluga whale and the southwest DPS of the Northern sea otter." As written in earlier chapters of the DEIS, only Alternative 3A excludes beluga whale critical habitat from leasing. While a small area, Alternative 1 (Proposed Action) includes some beluga whale critical habitat. Therefore, it is inaccurate to say the Proposed Action does not entail leasing designated critical habitat.

If you have any questions about our recommendations, please contact Verena Gill at (907) 271- or Verena.Gill@noaa.gov.

Sincerely,

for Robert D Mecum

James W. Balsiger, Ph.D.
Administrator, Alaska Region

cc: Sharon Randall (sharon.randall@boem.gov)
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Tribal Governments

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PUBLIC SUBMISSION

As of: September 07, 2016
Received: September 06, 2016
Status: Posted
Posted: September 07, 2016
Tracking No. 1k0-8rrd-rt08
Comments Due: September 06, 2016
Submission Type: Web

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0095
Comment from Michael Opheim, Seldovia Village Tribe

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Government Agency Type: Tribal

General Comment

See attached file(s)

Attachments

SVT BOEM Comment Letter 2016

SELDOVIA VILLAGE TRIBE
Tradition Integrated with Technology

September 6, 2016

Re: Cook Inlet Planning Area Lease Sale 244

To Whom It May Concern:

Seldovia Village Tribe would like to give input on this proposed Cook Inlet Oil and Gas Lease Sale 244.

Lease sales in lower Cook Inlet are and will continue to be a bad idea no matter who proposes them. In recent days leading up to the deadline for this open comment period industry has shown that it is not able to keep track of and maintain aging infrastructure all ready in place in Cook Inlet.

Why would we want to continue to put resources that are all ready on the decline in more danger by adding more drill rigs and more pollutants finding their way into Cook Inlet via the rather lax APDES permit that will be out for comment this fall. Ask some of the elders who have lived here all their lives what the resources used to be and what they have now. Do we really need to jeopardize this fragile environment so much more with fracking, drilling, and air cannons going off to find the oil and gas pockets.

The resources of Cook Inlet are not only used by the Native Peoples that have lived here for millennia but the non native peoples who have come to the state for a better life and cleaner healthier food resources.

The price of crude oil is down right now and doesn't warrant more exploration drilling but maybe a focus on the oil and gas resources industry has now that can be extracted using new technology that maybe doesn't include fracking.

One concern we have is that BOEM needs to consider the subsistence areas of all Cook Inlet Tribes (including Seldovia Village Tribe) potentially affected by future development in the Lease Sale area. Furthermore, BOEM should ensure they are utilizing current subsistence and scientific data when considering Lease Sale boundaries, and not just relying on old or limited data provided during the Sale 191 process.

In terms of future environmental studies focusing on Cook Inlet:

PO Drawer L • Seldovia, Alaska 99663 • Tel: 907.234.7898 • Fax: 907.234.7865 • Email: svt@svt.org • Web: www.svt.org

1) in reference to the Coastal Habitat Maps: closing spatial gaps in shorezone imagery and data for the Cook Inlet Area, we would encourage BOEM to take advantage of the data already collected by NOAA, AOOS, and CIRCAC.

2) in reference to the Subtidal and intertidal habitats and invertebrate biota in lower Cook Inlet, there is the statement that: "Native communities in Port Graham and Nanwalek have noted a substantial decline in shellfish populations and have expressed concern over the potential loss from contamination of subsistence resources". Other Cook Inlet communities, if asked, may express similar concerns and interest(s). All of these concerns and interests need to be included and considered in future research, potentially leading to additional partnerships. For instance, in 2015, in collaboration with EPA and ADEC's fish tissue monitoring program, SVT staff undertook contaminant testing of a total of 36 sockeye salmon and 40 dolly varden trout, collected from around Seldovia, Port Graham, Nanwalek, and Tyonek. It would be great if these efforts could be built upon and incorporated into such a study. For instance, perhaps different life stages of salmon or more resident fish species could be tested. A good resource for identifying species that maybe BOEM should consider focusing on (at least for the communities of Seldovia, Port Graham, Nanwalek, and Tyonek) is SVT's report, "Assessment of Cook Inlet Tribes Subsistence Consumption" found online at http://cms.svt.org/uploads/files/Assessment%20of%20Cook%20Inlet%20Tribes%20Subsistence%20Consumption93013%20FINAL.pdf

Another good resource would be "Survey of chemical contaminants in fish, invertebrates and plants collected in the vicinity of Tyonek, Seldovia, Port Graham and Nanwalek – Cook Inlet, AK"

We would also like BOEM to consider potentially collaborating with the Alaska Native Harbor Seal Commission and/or the Alaska Sea Otter and Steller Sea Lion Commission to test for PAH levels in tissue samples from animals collected within Cook Inlet.

If you would like to contact me and ask any questions about our comments you can reach me at (907) 435-3247 or our President/CEO, Crystal Collier, at (907) 435-3265.

Sincerely,

SELDOVIA VILLAGE TRIBE

Michael Opheim
Environmental Coordinator

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State Government

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PUBLIC SUBMISSION

As of: September 07, 2016
Received: September 01, 2016
Status: Posted
Posted: September 01, 2016
Tracking No. 1k0-8rnz-sykg
Comments Due: September 06, 2016
Submission Type: Web

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0061
Comment from Jeanette Alas, Alaska Department of Fish & Game

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Organization: Alaska Department of Fish & Game
Government Agency Type: State

General Comment

See attached file(s)

Attachments

ADF&G comments on CI Lease Sale 244 Draft EIS

MEMORANDUM STATE OF ALASKA

DEPARTMENT OF FISH AND GAME
Division of Habitat

TO: Caron McKee
Lease Sale 244 Environmental Coordinator
Bureau of Ocean Energy Management, Alaska OCS Region

FROM: Megan Marie st for
Acting Regional Supervisor, Anchorage Area Office
Alaska Department of Fish and Game, Division of Habitat

DATE: September 1, 2016

SUBJECT: ADF&G comments on Cook Inlet Lease Sale 244 Draft EIS (OCS EIS/EA BOEM-2016-004)

The Alaska Department of Fish and Game (ADF&G) received the Bureau of Ocean Energy Management's Draft Environmental Impact Statement (EIS) for the Cook Inlet Planning Area (OCS EIS/EA BOEM 2016-004). We have reviewed the Draft EIS and provided comments below. If you have any questions or require additional information, please contact Habitat Biologist Jeanette Alas at 267-2805 or Jeanette.Alas@alaska.gov.

Ecc:	A. Ott, ADF&G HAB	P. Shields, ADF&G CF
	J. Rumble, ADF&G CF	G. Hollowell, ADF&G CF
	J. Baumer, ADF&G SF	S. Ivey, ADF&G SF
	M. Miller, ADF&G SF	J. Pawluk, ADF&G SF
	J. Selinger, ADF&G WC	D. Battle, ADF&G WC
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	E. Weiss, ADF&G WC	J. Meehan, ADF&G WC
	J. Fall, ADF&G SUB	B. Davis, ADF&G SUB
	D. Rosenberg, ADF&G WC	V. Litchfield, ADF&G HAB
	R. Small, ADF&G WC	S. Goodglick, ADF&G WC

Page 1-13, 1.5.6. Pollution Prevention and Oil-Spill Respone
ADF&G strongly supports pollution prevention and oil-spill response planning and regulatory requirements.

Page 2-45, 2.8. Summary of Impacts by Alternative and throughout entire document
ADF&G disagrees that a 22% chance of one or more large spills occurring should be considered "unlikely". The consistent and repeated use of this term throughout Chapter 4 when discussing impacts from a large oil spill to the physical environment, biological environment, socioeconomic and socialcultural systems, and oil and gas related infrastructure appear to unnecessarily lessen the severity these impacts may have.

Pages 3-37 to 3-39, 3.2.2.2. Groundfish
ADF&G recommends the following reference to update this section, including detailed information about current fisheries, as well as historical commercial and personal use fisheries information.

Rumble, J., E. Russ, and C. Russ. 2016. Cook Inlet Area groundfish management report, 2012–2015. Alaska Department of Fish and Game, Fishery Management Report, *In Press*, Anchorage.

Pages 3-39 to 3-43, 3.2.2.3. Shellfish
ADF&G recommends the following reference to update this section, including detailed information about current fisheries, as well as historical commercial and personal use fisheries information.

Rumble, J., M. Wessel, E. Russ, K. J. Goldman, P. Shields and C. Russ. 2016. Cook Inlet Area and Prince William Sound commercial fisheries for Dungeness crab, shrimp, and miscellaneous shellfish through 2014. Alaska Department of Fish and Game, Fishery Management Report No. 16-24, Anchorage.

Pages 3-202 and 3-203, Kachemak Bay National Estuarine Research Reserve
ADF&G Division of Sport Fish is no longer a partner of the KBNERR (see http://www.adfg.alaska.gov/index.cfm?adfg=wildlifenews.view_article&articles_id=737). The new state partner is the Alaska Center for Conservation Science at the University of Alaska Anchorage (http://accs.uaa.alaska.edu/kbnerr/).

Page 4-1, 4.1.1. Impacts Scale and throughout entire document
ADF&G recommends replacing the term "moderate" with "major" and "major" with "severe". The term "moderate" does not imply "long lasting and widespread" impacts, and its use diminishes how substantial these impacts could be, as does the use of "major" for severe impacts.

Pages 4-69 to 4-71, 4.3.5.8. Accidental Oil Spills and Gas Release, Oil Spill Risk Analysis
ADF&G disagrees that a large oil spill contacting razor clam beaches on the west side of Cook Inlet would have only localized moderate impacts with populations measurably depressed for about a year. Depending upon the magnitude of the spill, the impacts to razor clams could be catastrophic, because large areas could be impacted due to the low slope of these beaches. In this case, razor clam populations would be measurably depressed for more than one year, or perhaps over a decade if oil persisted in sediments, as noted in the statement "A large spill would primarily affect beach and intertidal habitat because it would persist in those areas, possibly for more than a decade." In this event, the clams would become unacceptable for commercial markets and unacceptable to personal and sport harvesters possibly for many years.

Pages 4-177 and 4-178, 4.3.11.2. Noise, Active Acoustic Sound Sources
AD&G has concerns that seismic surveys conducted during the summer and fall months could interrupt salmon migration routes and the timing of salmon returning to their natal streams.

ADF&G offers the following suggested technical edits (recommended additions are underlined and recommended deletions are indicated by strikethrough text).

Page 3-200, 3.3.9. Areas of Special Concern
Cook Inlet includes lands designated by the ANILCA of 1980 as units of the NP, NWR, National Forest, Wild and Scenic Rivers, and National Wilderness Preservation Systems (P.L. 96-487). The following section describes land managed by the NPS, USFWS, and USFS, and describes Marine Protected Areas (MPAs), NERRs, NOAA-designated Habitat Conservation Areas (HCA), and several Alaska State resources managed by the ADFG and ADNR that could be impacted by oil and gas activities or an associated spill. The Cook Inlet proposed Lease Sale Area includes only the northern portion of the Cook Inlet OCS Planning Area. Lands with coastlines that are adjacent to and in the vicinity of the Cook Inlet are likely to have higher probability of being impacted by oil and gas activities and therefore are discussed in greater detail.

Pages 3-206 to 3-209, 3.3.9.5. State Resources
McNeil River State Game Sanctuary and Refuge
McNeil River State Game Sanctuary and Refuge are ~~is~~ located adjacent to each other southwest of the proposed Lease Sale Area and have~~s~~ ~~an~~ total area of over ~~77~~ 1,004 km^2 (~~200~~ 388 mi^2) (ADFG, 2015a) (Figure 3.3.9-2). The sanctuary and refuge contain the McNeil River which drains into Cook Inlet in Kamishak Bay. The river provides habitat for salmon, which are used as food by brown bears. McNeil River Falls is a world famous bear viewing area due to the high concentration of feeding bears and the ADF&G managed bear viewing program. Animals such as red fox, Arctic ground squirrels (*Urocitellus parryii*), harbor seals and bald eagles are common. Moose, caribou, wolves, wolverine, as well as various furbearers, waterfowl, sea ducks and seabirds may be observed in the sanctuary (ADFG, 2015a).

Trading Bay State Game Refuge
Trading Bay State Game Refuge is located north of the proposed Lease Sale Area, on the west coast of Cook Inlet. The ~~park~~ refuge contains wetlands and tidal flats and the area is best known for its waterfowl habitat (ADFG, 2015a) (Figure 3.3.9-2). The wetlands provide critical spring feeding, summer nesting, and fall staging habitat for thousands of ducks, geese, swans, and cranes. Brown bears forage on the tidal flats, and black and brown bears feed on salmon in the Noaukta Slough. Coho salmon, Chinook salmon, and sockeye salmon, rainbow trout, Dolly Varden, and smelt (*Osmerus spp.*) also are found in the refuge's streams and rivers (ADFG, 2015a).

Susitna Flats Game Refuge
Susitna Flats Game Refuge is located northeast of the proposed Lease Sale Area, in the upper portions of the Cook Inlet (Figure 3.3.9-2). The refuge contains sedge meadows, marshes, ~~and~~ intertidal mud flats, and forested upland areas (ADFG, 2015a). Susitna Flats is known for its high concentrations of migrating mallards (*Anas* spp.), pintails (*Anas spp.*), and Canada geese (*Branta canadensis*). Shorebirds include northern phalaropes, dowitchers (*Limnodromus spp.*), godwits (*Limosa* spp.), whimbrels (*Numenius spp.*), snipe (Scolopacidae), yellowlegs (*Tringa spp.*), sandpipers (*Actitis* spp.), rock sandpipers (*Calidris ptilocnemis ptilocnemis*), plovers

(*Charadrius spp.)*, and dunlin (*Calidris spp.*). From May to June, beluga whales congregate in the area extending from the Susitna River to calve, breed, and feed on eulachon fish. Harbor seals also haul out on tidal flats. Moose utilize the Susitna Flats to feed in the winter and calve in the spring within the fringing brushy thickets. Within Cook Inlet, the Susitna River and its tributaries support the second largest salmon-producing system (ADFG, 2015a).

Goose Bay and Palmer Hay Flats State Game Refuges
These state game refuges are located in the Knik Arm in the upper portion of ~~the~~ Cook Inlet near the population centers of Palmer and Wasilla (Figure 3.3.9-2). These are important areas for migratory and nesting waterfowl, other birds, terrestrial mammals, and fish, as well as for hunters, fishermen, and birdwatchers.

3.3.9.6. Anchorage Coastal Wildlife Refuge
Anchorage Coastal Wildlife Refuge is located northeast of the proposed Lease Sale Area, in the upper portions of the Cook Inlet (Figure 3.3.9-2). The refuge contains extensive tidal flats, marsh communities, and alder-bog forest (ADFG, 2015a). At least 130 bird species use this refuge, including waterbirds and shorebirds, snow geese, and raptors. Moose and various other terrestrial mammals are common in the refuge. Sticklebacks and sculpins (Cottidae) are ubiquitous. Migrating salmon and beluga whales also pass through nearshore waters.

3.3.9.7. Captain Cook State Recreation Area
Captain Cook State Recreation Area is located along the upper portion of Cook Inlet, northeast of the proposed Lease Sale Area (ADFG, 2015a) (Figure 3.3.9-2). Main features of the recreation area include the Stormy Lake and Swanson River, which has a shallow, silty estuary at its mouth. Beaches and mudflats are found offshore of the recreation area (ADFG, 2015a). The Swanson River and Stormy Lake are home to rainbow trout, coho salmon, and Arctic char. Mammals that visit the recreation area include moose, black bear, coyote, beaver, muskrat (*O. zibethicus*), and red squirrel (*T. hudsonicus*). Birds include thrushes (Turdidae), warblers (Parulidae), jays (Corvidae), mergansers (*Mergus spp.*), goldeneyes (*Bucephala spp.*), bald eagles, gulls (Laridae), and shorebirds. Wood frogs are found along the Swanson River. Small invertebrates, for example, amphipods, can be found beneath rocks at low tide (ADFG, 2015a).

3.3.9.8. Clam Gulch and Ninilchik State Recreation Areas
Clam Gulch and Ninilchik State Recreation Areas are located east of the proposed Lease Sale Area on the Kenai Peninsula (Figure 3.3.9-2). The Clam Gulch CHA also is located here, and runs from Cape Kasilof to Happy Valley. The region is famous for its razor clams, which are harvested annually on sandy beaches (ADNR, 2014b); however, in recent years low abundance has led to fishery closures (http://www.adfg.alaska.gov/static-sf/eonr/pdfs/2016/r2/eo-2-rcl-7-01-16_sport%20razor%20closure1.pdf). Moose, bald eagles, gulls, many small birds, and mammals are found in the recreation areas. Beaches and Deep Creek are sites of recreational saltwater fishing for Chinook salmon. Birds include Canada geese, snow geese (*Chen caerulescens*), sandhill cranes (*G. canadensis*), mallards (*Anas* spp.), pintails (*Anas* spp.), green-winged teal (*Anas crecca nimia*), goldeneyes (*Bucephala sp.)*, mergansers (*Mergus spp.*), buffleheads (*Bucephala spp.*), white-fronted geese (*Anser albifrons*) and various shorebirds (ADFG, 2015a). Ninilchik State Recreation Area is a popular staging area for world class salmon and halibut fishing (ADNR, 2014c). Other state recreation areas and sites are found here, including Kasilof River State Recreational Site, and Deep Creek, Anchor River, and Stariski State Recreation Areas. These areas are used for similar resources and activities.

3.3.9.9. Kachemak Bay State Park and Wilderness Park
Kachemak Bay State Park and Wilderness Park covers an area of approximately 1619 km2 (625 mi2) (ADFG, 2015a) (Figure 3.3.9-2). The parks contain mountains, glaciers, forests, ocean and portions of Kachemak Bay. ~~Kachemak Bay is a CHA and it supports sea otters, seals, porpoises, and whales.~~ Land mammals include moose, black bear, red squirrels, mountain goats, coyotes and wolves. The area is popular for birding and hosts eagles, gyrfalcons (*Falco rusticolus)*, puffins, sandpipers, and dunlins (Kachemak Bay State Park and Wilderness Park, n.d.; ADFG, 2015a).

3.3.9.11. Critical Habitat Areas
Redoubt Bay
Redoubt Bay CHA is located north of the proposed Lease Sale Area (Figure 3.3.9-2). The CHA provides spring and fall resting and feeding habitat for waterfowl on their way to and from nesting grounds to the north. It is also an important waterfowl nesting area for ducks, geese, swans, and many other birds during the summer (ADFG, 2015b). Redoubt Bay CHA is especially important for nesting tule white-fronted geese (*Anser albifrons gambelii*). Terrestrial mammals include moose, brown and black bears, coyote, fox, wolf, mink (*Neovison spp.*), river otter, marten (*Martes americana*), muskrat, wolverine, weasel (*Mustela sp.*), lynx, and beaver. Harbor seals have haulout locations in the mouths of streams. Beluga whales feed on salmon at the river mouths. Big River Lakes is a popular bear viewing and fishing destination in summer months.

Fox River Flats
Fox River Flats CHA is located at the head of Kachemak Bay and includes both tidal and upland areas, east of the proposed Lease Sale Area (Figure 3.3.9-2). ~~It is a component of the Kachemak Bay NERR (See Section 3.3.9.2).~~ The flats serve as habitat for waterfowl and shorebirds. Terrestrial mammals use the flats while searching for food. The CHA is a haul out location for harbor seals, and beluga whales feed on salmon at the river mouths (ADFG, 2015c).

Kachemak Bay
Kachemak Bay CHA is located within the ~~a component of~~ Kachemak Bay NERR, ~~located~~ east of the proposed Lease Sale Area (Figure 3.3.9-2). Description of the environment and wildlife is discussed in Section 3.3.9.2. Kachemak Bay CHA supports sea otters, seals, porpoises, and whales, shellfish, forage fish, salmon, migratory shorebirds, seaducks, and other seabirds.

Clam Gulch
The Clam Gulch CHA is ~~a component~~ located off-shore of the Ninilchik State Recreation Area ~~and is located~~ northeast of the proposed Lease Sale Area (Figure 3.3.9-2). Descriptions of the environment and wildlife ~~is discussed~~ are found in Section 3.3.9.8. The Clam Gulch CHA was created primarily to protect razor clam beds.

Page 4-261, 4.8.8 Birds
Potential impacts on ~~lower trophic level organisms~~ birds under Alternative 6 would not differ substantially from those described for the Proposed Action (Alternative 1) in Section 4.3.8.

Page 4-343, 4.12.18. Areas of Special Concern
Cook Inlet includes lands designated by the Alaska National Interest Lands Conservations Act of 1980 as units of the National Park, National Wildlife Refuge, National Forest, Wild and Scenic Rivers, and National Wilderness Preservation systems (P.L. 96-487). Within the proposed Lease Sale Area, there are lands managed by the NPS, USFWS, and U.S. Forest Service, including

MPAs, NERRs, NOAA-designated critical habitat areas, and several state resources managed by the ADF&G and ADNR.

PUBLIC SUBMISSION

As of: September 07, 2016
Received: September 06, 2016
Status: Posted
Posted: September 07, 2016
Tracking No. 1k0-8rrd-gqdc
Comments Due: September 06, 2016
Submission Type: Web

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0096
Comment from Sara Longan, State of Alaska

Submitter Information

Name: Sara Longan
Address:
550 West 7th Ave
Eagle River, AK, 99577
Email: sara.longan@alaska.gov
Organization: State of Alaska
Government Agency Type: State
Government Agency: Department of Natural Resources

General Comment

See attached file(s)

Attachments

SOA Comments CI LS 244 DEIS

STATE OF ALASKA

DEPARTMENT OF NATURAL RESOURCES
OFFICE OF PROJECT MANAGEMENT & PERMITTING

BILL WALKER, GOVERNOR

550 WEST 7TH AVENUE
ANCHORAGE, ALASKA 99501
PHONE: (907) 269-8690
FAX: (907) 269-5673

September 6, 2016

Caron McKee
Lease Sale 244 Environmental Coordinator
Bureau of Ocean Energy Management, Alaska OCS Region

Submitted via the Federal eRulemaking Portal

Re: State of Alaska Comments on the Cook Inlet Draft Environmental Impact Statement, Outer Continental Shelf (OCS) Oil and Gas Lease Sale 244 (BOEM Docket No. BOEM-2014-0001)

Dear Ms. McKee:

Recently, the Department of the Interior, through the Bureau of Ocean Energy Management (BOEM), issued a request for information soliciting comments for the Draft Environmental Impact Statement (DEIS) for the Cook Inlet Outer Continental Shelf (OCS) Lease Sale 244. The following comments on this DEIS are intended to help inform BOEM to comply with the National Environmental Policy Act (NEPA) and with the Outer Continental Shelf Lands Act (OCSLA) [the consultation process therein], ultimately to help adhere to the oil and gas leasing program (2012-2017) in the OCS. These DEIS comments are submitted in coordination with the Alaska Department of Environmental Conservation (ADEC).

The State of Alaska has offered formal comments and subject matter expertise throughout BOEM's 5-year (2012-2017) leasing cycle, beginning from the scoping periods for both the OCS Lease Programs and subsequent NEPA reviews for each Alaska OCS Planning Area. The State of Alaska continues to strongly encourage BOEM and the Department of Interior to avoid delaying offshore OCS leasing in the three Alaska planning areas. We support the opportunity for a special-interest lease sale in the Cook Inlet Planning Area (Lease Sale 244). This lease sale approach, if adhered to, is consistent with both BOEM's required purpose of the OCS Land Act "to ensure that the extent of oil and gas resources of the Outer Continental Shelf is assessed at the earliest practicable time." With the increased exploration of the state submerged lands in Cook Inlet, conducting more lease sales of the adjacent federal OCS lands of the Cook Inlet would allow interested parties to consider exploratory programs to assess the resource prospectivity on both state submerged and adjacent federal OCS lands.

Oil and gas development and production in the Cook Inlet has occurred over the last 50 years and remains a vital resource for local residents, offering energy security and local jobs. Cook Inlet oil and gas development has successfully coexisted with other industries, including fishing, transportation, and tourism. Largely as a result of this development, extensive environmental studies and monitoring programs have been conducted over the past 50 years. There is sufficient information available, collected from years of data gathering and traditional knowledge, about Alaska's OCS planning areas to proceed with oil & gas activities that comply with defined mitigation and environmental stipulations designed to relieve adverse impacts.

The State of Alaska strongly encourages BOEM to adhere to a five-year leasing plan in the Cook Inlet that ensures timely and predictable access to Alaska's highly prospective OCS lands. The state has agency experts with significant expertise in the prudent development and management of Alaska's resources. We look forward to continuing our work with BOEM to provide this expertise as a cooperating agency during the NEPA review process for the Cook Inlet Lease Sale 244 Draft Environmental Impact Statement (EIS).

Sincerely,

Sara Longan, Executive Director
Office of Project Management & Permitting
Alaska Department of Natural Resources

cc: Andy Mack, Commissioner, Alaska Department of Natural Resources
Craig Fleener, Director, State & Federal Relations, Office of the Governor, State of Alaska
Larry Hartig, Commissioner, Alaska Department of Environmental Conservation
Gary Mendivil, Alaska Department of Environmental Conservation, Office of the Commissioner

Enclosed:

State of Alaska comments

State of Alaska Comments on Cook Inlet Lease Sale 244 DRAFT EIS

Document name	Section # (i.e. 2.1.4)	Page #	Figure # / Table #	Comment
Executive Summary	Environmental Consequences	ES-3	Table ES-1	The text on this page and table treat routine activities and spills as if they were the same. While small spills can be anticipated based on historical information, large spills are remote and speculative as noted elsewhere in the document. Please separate the discussions of known impacts from those that are speculative in this document.
Chapter 2	Alternatives	2-31		Alternative B on this page includes zero discharge of drilling fluids and drill cuttings in the entire lease area. A comparison of the impacts indicates that there was little additional mitigated impact from eliminating the discharge when compared to the proposed alternative. Please explain more clearly why this alternative is being proposed.
Chapter 2	Alternatives	2-31		The final sentence in this last paragraph should have the word "state" capitalized, as in **State of Alaska**
Chapter 2	Alternatives	2-32		Paragraph three on this page uses the abbreviation RSLP. Please spell out " Regional Supervisor, Lease and Plans" the first time it is used in a section.
Chapter 2	Alternatives 2.6.3.5	2-39		This section discusses sensitive areas to be considered in oil spill response plan. Please cite to the Unified Plan, which as sensitive areas described for the Cook Inlet Region.
Chapter 2	Alternatives	2-44-45		This section discusses issues considered but not analyzed and further states that end use consumption of oil and gas is not part of the proposed action, and that the EIS does not attempt to quantitatively analyze or model environmental effects from the end use consumption of produced oil and gas. This statement may conflict with the CEQ guidance on climate change and greenhouse gas emissions that was released on August 1, 2016. If this statement does not conflict with CEQ guidance, please explain why.
Chapter 3	Air Quality	3-17		The second sentence in paragraph two on this page notes that "*Therefore, the standards established in the **ACC** are presumed to be primary.*" It is assumed the writer was referring to the Alaska Administrative Code, which is abbreviated "AAC". A similar error is found in the third sentence in paragraph two and again in paragraph seven and eight. Please correct these abbreviations.
Chapter 3	Air Quality	3-17		The third sentence in the paragraph two on this page notes that "*Alaska does not establish the EPA 2015 primary NAAQS of 0.070 as the 8-hour standard for ozone (18 AAC Sec. 50.010(4)) and instead*

1

State of Alaska Comments on Cook Inlet Lease Sale 244 DRAFT EIS

Document name	Section # (i.e. 2.1.4)	Page #	Figure # / Table #	Comment
				uses the EPA 2008 standard of 0.075." This statement is no longer correct. Alaska adopted the EPA 2015 standard of 0.070 for ozone and those regulations became effective as of August 20, 2016.
Chapter 3	Air Quality	2-31		Paragraph seven notes that "*States maintain jurisdiction to control air pollution from OCS sources located within 25 nm of the SSB (CAA Sec. 328(a) and 43 U.S.C. 7627), which for Alaska extends to a point 28 nm seaward from the baseline. Within this area of water, the State of Alaska must attain and maintain Federal and State ambient air quality standards and comply with the provisions of Sec. 328 of the Clean Air Act (CAA) (42 U.S.C. 7627).*" This statement is incorrect. The State of Alaska only maintains jurisdiction to control pollution in territorial waters which extend 3nm from the coastline. BOEM and EPA have jurisdiction to control air pollutions from 3nm to 28nm from the coastline. The only influence Alaska has on these offshore waters is that federal regulations at 40 C.F.R. 55.2 requires the federal agencies to enforce the ambient air quality standards that exist in the "corresponding onshore area" or COA.
Chapter 3	Water Quality	3-21		Sentence five in paragraph two on this page notes that "*highest suspended sediment fluxes occur in summer as glaciers recede.*" It would be more accurate say "**as glacier melt increases**" rather than "as glaciers recede".
Chapter 4	4.2 Impact-Producing Factors for Routine Activities	4-3	Table 4.2-1	This section heading "Impact-Producing Factors for Routine Activities" implies that the discussion will be limited to routine activities, but the far right column in Table 4.2-1 is labeled **Accidental Oil Spills and Gas Releases**. It is not clear how accidental releases can be routine. While small spills can be anticipated based on historical information, large spills are remote and speculative as noted elsewhere in the document. Please separate the discussions of known impacts from those that are speculative in this document. Please explain why accidental releases are included with routine activities or remove the information in the far right column of the table.
Chapter 4	4.2.6 Air Pollutant and Greenhouse Gas Emissions	4-12		The final sentence in paragraph two on the pages notes that "*this EIS does not attempt to quantitatively analyze or model environmental effects from the end use consumption of produced oil and gas.*" This statement may conflict with the CEQ guidance on climate change and greenhouse gas emissions that was released on August 1, 2016. If this statement does not conflict with CEQ guidance, please explain why.
Chapter 4	4.12 Impacts of a Very Large Oil Spill	4-268	Table 4.12-1	It is not clear in this table and other discussions why spill response and cleanup is placed in the phase progression of a VLOS scenario at the number 4 position, after onshore contact, rather than before onshore contact. Alaska spill response regulations require spill response to be rapid and effective to prevent onshore contact and pollution. Given the fact that state waters are immediately adjacent to the

2

State of Alaska Comments on Cook Inlet Lease Sale 244 DRAFT EIS

Document name	Section # (i.e. 2.1.4)	Page #	Figure # / Table #	Comment
				proposed lease sale area, spill response and cleanup should be placed in the phase three position to accurately reflect this priority.
Chapter 5	5.1.2.14 Climate Change	5-24		Sentence one in this section cites to CEQ guidance issued in 2010 with regard to climate change. Please update this sentence to cite to the CEQ August 1, 2016 guidance regarding climate change and greenhouse gas emissions.
Chapter 5	5.2.1.3 Analysis of Cumulative Effects	5-30		Paragraph three on this page notes that "*The cumulative impacts analysis does not analyze impacts associated with end use consumption of oil and gas resources which may be produced as a result of this lease sale. As discussed in Section 2.7.2. (Issues Considered but Not Analyzed), NEPA does not require analysis of impacts that are not a direct, indirect or cumulative impact of the Proposed Action.*" This statement may conflict with the CEQ guidance on climate change and greenhouse gas emissions that was released on August 1, 2016. If this statement does not conflict with CEQ guidance, please explain why.
Chapter 7	Literature Cited	7-4		The reference cited as ADEC 2015a should be updated. The latest version of the Air Quality Control regulations is effective as of August 20, 2016. The reference cited as ADEC 2015b is cited incorrectly. The correct citation should be to the Alaska Department of Commerce, Community and Economic Development (ADDCED). The reference cited as ADEC 2015c and 2016d should be updated. The latest version of the Air Quality Control regulations is effective as of August 20, 2016.

3

Local Government

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PUBLIC SUBMISSION

As of: August 31, 2016
Tracking No. 1k0-8rih-v22g
Comments Due: September 06, 2016

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0046
Comment from Mike Navarre, KPB Mayors Office

Submitter Information

Name: Mike Navarre
Organization: KPB Mayors Office
Government Agency Type: Local
Government Agency: Kenai Peninsula Borough

General Comment

See attached file(s)

Attachments

Environmental Impact Statement for Cook Inlet Lease Sale 244

KENAI PENINSULA BOROUGH
144 North Binkley Street ● Soldotna, Alaska 99669-7520
Toll-free within the Borough: 1-800-478-4441 Ext. 2150
PHONE: (907) 714-2150 ● **FAX:** (907) 714-2377
www.mayor.kenai.ak.us
Mike Navarre
Borough Mayor

August 24, 2016

Caron McKee, Lease Sale 244 Environmental Coordinator
Bureau of Ocean Energy Management, Alaska OCS Region
3801 Centerpoint Drive, Suite 500
Anchorage, AK 99503-5823

Re: Draft Environmental Impact Statement for Cook Inlet Lease Sale 244

Residents of the Kenai Peninsula Borough strive for balance in natural resource development and consumption. Whether fisheries or wildlife or oil and gas, we look for the best answer for all concerned, not just the best answer for any one group. Whether commercial, charter or personal-use salmon fishing, whether recreational off-roaders, whether oil and gas exploration and development, borough residents work hard — contentiously, at times — to find those elusive but achievable best answers that do not place one user or resource ahead of another.

With that goal in mind, I offer my comments on the draft environmental impact statement for the Bureau of Ocean Energy Management's proposed Cook Inlet Lease Sale 244.

At 6 pounds, 2½ ounces, the draft EIS is a substantial document. I appreciate the range of alternatives for the lease sale, and the detailed analysis of each one. I don't proclaim to be an expert on beluga or salmon habitat, birds, otters, water column movements or air quality. But as mayor of the Kenai Peninsula Borough, I serve as an elected expert on the best interests of more than 58,000 residents. And those best interests are best served by a strong oil and gas industry — a safe and environmentally responsible oil and gas industry. Cook Inlet oil production is on the upswing, and natural gas production has stabilized, with gas producers able to sign contracts ensuring deliveries to Southcentral Alaska utilities into early in the next decade. Those gains are good for the state and for the Kenai Borough economy, and I hope Lease Sale 244 can contribute to that positive direction in the future. It was good to read on Page 1-4 of the draft EIS that BOEM estimates "an undiscovered economic resource of approximately 215 million barrels of oil and 571 billion cubic feet of natural gas in two fields within the proposed Cook Inlet lease sale could be discovered and developed." Those benefits are relevant for the EIS and the bureau's final determination.

I have no doubt that the bureau's EIS process on Lease Sale 244 will elicit a wide range and large volume of thoughtful comments and constructive recommendations from borough residents, resource and habitat experts, the oil and gas industry and other groups. And I trust that the Bureau of Ocean Energy Management will listen, consider and incorporate the comments and recommendations into the final EIS and its decision on the lease sale — the best answer being the one that balances all users.

In particular, it is encouraging to see the bureau's consideration in the draft EIS of the Cook Inlet gillnet fishery, and the need to avoid any disruption or conflicts with that important activity. As the draft EIS said, communication and notification of the gillnetters are important in that regard.

As to other comments from the mayor's office:

While the oil and gas industry works hard to follow best practices, to make no mistakes and to have no accidents, the potential always exists. As much as the draft EIS looks at potentially affected resources from well-managed oil and gas exploration and development, I caution the bureau to devote an equally strong focus to what happens and what should be done if something goes wrong. The draft EIS says BOEM estimates a 22 percent chance of a large oil spill over a 40-year life of exploration and development in Lease Sale 244. It's that 22 percent chance of a large spill that should always remain at the top of everyone's concerns. Can the odds be improved? Is the industry, and is government, fully prepared to deal with the consequences? Can anyone quantify the impact of a large spill, so that the community can assess the pros and cons of development that is so essential to our economic health? This is not to say the 22 percent estimate means stop the lease sale; just that it's always better to look hard at what we hope never happens so that we are fully prepared if it does happen.

Part of that accident prevention effort should include adequate staffing at remote oil and gas facilities, continued planning coordination with local emergency responders, and always asking the question of benefits vs. risks. Borough residents accept and understand there are risks in any development, whether oil and gas or new subdivisions near wildlife habitat. A full discussion of those risks is what's needed and is addressed in the bureau's draft EIS.

One comment regarding the bureau's choice of wording in the draft EIS: On Page ES-3, Environmental Consequences, it says: "Impacts of routine activities and small spills ranged from negligible to moderate for all resources." But counting all the impact boxes, I see that of the 20 resources measured for impacts, only one (birds) was judged at risk of "minor to moderate" impacts from routine activities during exploration and development in Lease Sale 244. The other 19 resources were all listed at minor or negligible risk during routine activities, and all 20 were at minor to negligible risk in cases of a small spill. It seems to me that a single "minor to moderate" ranking among 40 boxes to check does not warrant the statement that "impacts … ranged from negligible to moderate for all resources."

Thank you for your consideration.

Mike Navarre
Mayor

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Citizen Advisory Councils

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PUBLIC SUBMISSION

As of: August 31, 2016
Tracking No. 1k0-8rmm-8tsl
Comments Due: September 06, 2016

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0051
Comment from Michael Munger, Cook Inlet Regional Citizens Advisory Council (CIRCAC)

Submitter Information

Name: Michael Munger
Organization: Cook Inlet Regional Citizens Advisory Council (CIRCAC)

General Comment

The Cook Inlet Regional Citizens Advisory Council (CIRCAC) requests an extension of at least 30 business days, with comments due no earlier than October 18th, 2016. Please see attached letter.

Attachments

2016.8.29.BOEM_CIRCAC_request for extension

BOEM-2014-0001-0051.html[9/2/2016 8:48:37 AM]

COOK INLET RCAC

"The mission of the Council is to represent the citizens of Cook Inlet in promoting environmentally safe marine transportation and oil facility operations in Cook Inlet."

Members

Alaska State Chamber of Commerce
Alaska Native Groups
Environmental Groups
Recreational Groups
Aquaculture Associations
Fishing Organizations
City of Kodiak
City of Kenai
City of Seldovia
City of Homer
Kodiak Island Borough
Kenai Peninsula Borough
Municipality of Anchorage

August 30, 2016

Ms. Caron McKee, Lease Sale 244 Environmental Coordinator
Bureau of Ocean Energy Management,
Alaska OCS Region,
801 Centerpoint Drive, Suite 500,
Anchorage, Alaska 99503-5823

RE: Draft Environmental Impact Statement for Cook Inlet Lease Sale 244 (Docket BOEM-2014-0001-046)

Dear Ms. McKee,

The Cook Inlet Regional Citizens Advisory Council (CIRCAC) is requesting an extension on the comment period for review of the draft Environmental Impact Statement (EIS) for proposed Cook Inlet Lease Sale 244. CIRCAC is a citizen's oversight council for oil industry operations in the Cook Inlet region, and was established according to Section 5002 of the Oil Pollution Act of 1990 (OPA 90). Through this act, our thirteen-member Board of Directors represents boroughs, cities, and municipalities in the Cook Inlet region, as well as Alaska Native groups, commercial fishing, and aquaculture, tourism, recreational and environmental interest groups.

A vast volume of information is referenced and summarized in the EIS documents, including analyses of a number of lease sale alternatives and oil spill risks. A thorough examination of those documents requires input by people familiar with the Cook Inlet area so that the assumptions and interpretations made for the various analyses and alternatives can be evaluated. Our Environmental Monitoring Committee met recently and noted that the current comment period from mid-July through September 6th encompasses a period when many Alaskans are busy with commercial, recreational, and subsistence fishing, foraging, field work, and other outdoor activities that can only be accomplished during our summer and fall seasons.

To ensure that we can best represent our stakeholders in providing thoughtful review and meaningful recommendations, we request an extension of at least 30 business days, with comments due no earlier than October 18th, 2016. If you have any questions, please do not hesitate to call me at the number below or at munger@circac.org.

Sincerely,

Mr. Michael Munger
Executive Director

Cc: Dr. James Kendall, Alaska Regional Director, BOEM
John Callahan, Public Affairs Officer, Alaska Region, BOEM

*Cook Inlet Regional Citizens Advisory Council * 8195 Kenai Spur Highway, Kenai, AK 99611-8033*
*Phone: (907) 283-7222 * Fax (907) 283-6102*

PUBLIC SUBMISSION

As of: September 07, 2016
Received: September 06, 2016
Status: Posted
Posted: September 07, 2016
Tracking No. 1k0-8rrf-woyb
Comments Due: September 06, 2016
Submission Type: Web

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0087
Comment from Michael Munger, Cook Inlet Regional Citizens Advisory Council (CIRCAC)

Submitter Information

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Phone: 9072837222
Organization: Cook Inlet Regional Citizens Advisory Council (CIRCAC)

General Comment

Please see attached comments

Attachments

2016 9 6 CIRCACcommentsBOEM244

BOEM-2014-0001-0087.html[9/7/2016 10:08:15 AM]

COOK INLET RCAC

"The mission of the Council is to represent the citizens of Cook Inlet in promoting environmentally safe marine transportation and oil facility operations in Cook Inlet."

Members

Alaska State Chamber of Commerce
Alaska Native Groups
Environmental Groups
Recreational Groups
Aquaculture Associations
Fishing Organizations
City of Kodiak
City of Kenai
City of Seldovia
City of Homer
Kodiak Island Borough
Kenai Peninsula Borough
Municipality of Anchorage

6 September 2016

Ms. Abigail Ross Hopper, Director
Bureau of Ocean Energy Management
45600 Woodland Road
Sterling, VA 20166

RE: Draft Environmental Impact Statement for Cook Inlet Lease Sale 244 [FR Doc. 2016-16847]

Dear Ms. Hopper,

Thank you for this opportunity to submit comments on the Draft Environmental Impact Statement (DEIS) for the Cook Inlet Planning Area Oil and Gas Lease Sale 244. These comments are submitted on behalf of Cook Inlet Regional Citizens Advisory Council (CIRCAC), a citizen's oversight council for oil industry operations in the Cook Inlet region and established according to Section 5002 of the Oil Pollution Act of 1990 (OPA 90). Through this act, we represent 13 communities and organizations in promoting environmentally safe marine transportation and oil facility operations in Cook Inlet. In doing so, the Council strives to help protect the environment, fisheries, economic vitality, cultural resources and recreational interests of Cook Inlet, in part by promoting partnerships among citizens, agencies, and industry.

Throughout its twenty-five year history, CIRCAC has debated the role of its representatives in taking a position for or against a lease sale. Through those discussions, CIRCAC's Board of Directors has taken the position that it does not endorse, advocate for, oppose, or advocate against a lease sale. Our comments focus on the public process provided for review of the DEIS and how the literature and data for Cook Inlet are presented, interpreted, and analyzed within the DEIS. Our comments note comprehensiveness of the DEIS, inconsistencies, missing information, and recommendations for improved analyses based on our knowledge of Cook Inlet and our understanding of its physical, biological, geologic, geomorphic, and chemical environment.

CIRCAC is frustrated with BOEM's inflexibility for extending the review process. BOEM received several requests for an extension, including ours, where we noted that the current comment period from mid-July through September 6 encompassed the season when stakeholders who know the most about the Cook Inlet environment are those least likely to be able to fully participate since they are out working in, researching, and managing its habitats and resources.

If you have any questions, please do not hesitate to contact me at the number below or at munger@circac.org.

Sincerely,

Mr. Michael Munger
Executive Director

*Cook Inlet Regional Citizens Advisory Council * 8195 Kenai Spur Highway, Kenai, AK 99611-8033*
*Phone: (907) 283-7222 * Fax (907) 283-6102*

Cook Inlet Regional Citizens Advisory Council (CIRCAC)
Comments on the Draft Environmental Impact Statement for the Cook Inlet Planning Area Lease Sale 244
6 September 2016

DEIS Public Review Process

BOEM should immediately reverse its decision announced on September 1, 2016, to not extend the 45-day public review process for the DEIS. The reason provided for denying requests for extensions was that "enough time was provided for review," ignoring the main point of the requests which was the *timing* of the public comment period. In its 2017-2022 Outer Continental Shelf Oil and Gas Leasing Proposed Program[1], BOEM provides a diagram of its oil and gas leasing program development process (Figure 1-5 in Boem 2016). In that process, they clearly identify that the comment period for the Draft EIS is 45-90 days. *This is up to double the amount of time provided for the Cook Inlet Lease Sale 244 DEIS review*. BOEM (2016) also describes the process for Exploration Plan (EP) and Development and Production Plan (DPP) approvals, whereby BOEM will conduct separate NEPA analyses for each stage prior to issuing the permits. However, this process does not provide for public review and comment, though the EP and DPP NEPA analyses will likely rely heavily on the NEPA analyses provided in the DEIS. This points, again, to the need for a thorough public review *now* to ensure that BOEM produces a robust and accurate analysis of environmental consequences for potential lease sale activities.

According to the *A Citizens Guide to NEPA*[2], during the National Environmental Policy Act (NEPA) process for a given action, "*citizens often have valuable information about places and resources that they value and the potential environmental, social, and economic effects that proposed federal actions may have on those places and resources*." It also states that NEPA's requirements "*provide you the means to work with the agencies so they can take your information into account*." Specifics under NEPA say that in carrying out its duties for fulfilling the social, economic, and other requirements of present and future generations of Americans, it is the policy of the Federal Government to do so "*in cooperation with State and local governments, and other concerned public and private organizations*" and to "*use all practicable means, consistent with other essential considerations of national policy, to improve and coordinate Federal plans, functions, programs, and resources…*"[3] Finally, BOEM provides the following note to the public that they "*view the EIS process as providing a balanced forum for early*

[1] BOEM 2016. http://www.boem.gov/2017-2022-Proposed-Program-Decision/
[2] Council on Environmental Quality. 2007. Executive Office of the President, Washington, DC.
[3] National Environmental Policy Act Sec. 101 [42 USC § 4331]

identification, avoidance, and resolution of potential conflicts. It is in this spirit that we welcome comments from all concerned parties.[4]

The message we've taken away from the above sources is that (1) Cook Inlet citizens might have valuable information about local resources at risk by potential activities from Lease Sale 244, as well as how the activities may potentially affect those resources, (2) BOEM will *cooperate* with concerned public and private organizations (among others), (3) BOEM will use *all practicable means* to improve the DEIS, (4) BOEM wishes to ensure *early* identification, avoidance, and resolution of potential conflicts, and (5) BOEM welcomes comments from *all* concerned parties (italics are ours). Thus, it is especially perplexing that BOEM denied the very reasonable request to extend the comment period to avoid conflicts with the availability of known major stakeholders. By providing an extension, BOEM would have taken steps to ensure they've *cooperated* and used *practicable means* to increase the likelihood that they identify potential conflicts *early* on and that *all concerned parties* are provided the opportunity to fully participate – especially those who have been out making their living, studying, and providing subsistence foods from Cook Inlet resources throughout the public comment period.

In preparing the DEIS, BOEM had over 70 participating authors, internal reviewers, and fact-checkers,[5] some of whom worked on the six-pound document for almost two years. They cite over 2000 separate literature sources for information used to analyze risks, consequences, and effects of lease sale activities, including from 'Very Large Oil Spills,' and for a range of lease sale Alternatives. At any time, a thoughtful and thorough review of this document would be difficult, but for some major Cook Inlet stakeholders, to expect it in July and August is unreasonable.

The timing is especially surprising since BOEM was well aware that the middle of the summer is the worst possible time to ensure participation and review by concerned parties. In fact, in the DEIS, BOEM evaluates a Gillnet Fishing Mitigation Alternative, noting that the season runs from June to late August. So, they shouldn't be surprised that this stakeholder group has, in fact, been out fishing. The exact people who know the most about the habitats and resources at risk are those least likely able to fully participate during this review process, including those commercial fishermen, as well as subsistence users and Cook Inlet researchers and resource managers.

DEIS Organization

This DEIS was difficult to navigate. Something as simple as carrying headers or major category titles through a section would help the reader keep track of where the document is focusing on that page. There are hundreds of headings and subheadings in the document and appendices.

[4] http://www.boem.gov/nepaprocess/
[5] Bureau of Ocean Energy Management (BOEM), Cook Inlet Planning Area Oil and Gas Lease Sale 244 Draft Environmental Impact Statement (DEIS), OCS EIS/EA BOEM 2016-004, Volume 2, 6..5, Table 6.2.

This, too, could become ungainly, but it was difficult to track the headings that represented combinations of Alternatives **x** Resources **x** Impact Producing Factors, in addition to headings for Activity Phase and type of oil spill. Also, given the complexity of the document, it is imperative that these headings be carefully checked so that cross-referencing is possible. An example was in Appendix A-3.1.2 (Trajectory Analysis Periods) where it said "The OSRA launches a hypothetical oil-spill trajectory from a hypothetical location called a launch point (described in Section 3.1.5)…" However, without using the correct location at A-3.1.5, it wasn't clear that they meant the Appendix, so when searching 3.1.5 in the DEIS chapters, the reader is directed to a section summarizing Water Quality. A simple mistake, but when scattered throughout the document, it can lead to additional confusion.

The DEIS's lack of integration and lack of effort by some of the section authors to provide their information in the context of Cook Inlet, required the reader to attempt to do so. But, to effectively do this requires access to the many literature sources and the time to read and interpret them. This lack of providing a Cook Inlet context in a meaningful way, once again, points to the need for an extended review period to allow access to some of the Cook Inlet experts who published the data and who may have been unavailable due to fieldwork schedules.

The flow of the document did not always make sense. For example, under the Physical Oceanography Section[6], net circulation and salinity trends are described before a description of freshwater sources to Cook Inlet, when it is recognized that for much of the Inlet it is freshwater that drives the baroclinic, or net, currents, and is the main factor determining salinity. These sources include the major rivers at the head of Cook Inlet that play major roles in the net southward flow along the western boundary of Cook Inlet, as well as the many coastal rivers contributing to the low salinity of the relatively fresh Alaska Coastal Current (ACC). Though freshwater influx is brought into the descriptions of circulation and salinity, it is following these sections when riverine input is finally described under its own heading.

In reading the document, it becomes obvious that it involved many authors with varying degrees of experience researching and integrating information, interpreting data, and writing technical reports or EIS. Some sections try to provide the information about the affected environment or resource in a way that puts the habitat or species in the context of the proposed lease sale area. For example, the author describing Shorebirds in Section 3.2.5 appeared to have compiled multiple data sources and placed this potentially affected species in the context of Cook Inlet throughout their subheading sections. In contrast, much of the fish section[7] included long descriptions about the general habitat and life histories of each species, with little effort to extract pertinent Cook Inlet information or place the information in a Cook Inlet context (described further below).

Additionally, some authors were content with using other previous summary reports as the only source of most of the information in their section. One of the concerns with that is that each time a report summarizes information (e.g. this DEIS), other following efforts might then use it as the

[6] DEIS, Section 3.1.3
[7] DEIS, Section 3.2.2

reference for a particular subject. This can lead to a literature reference in a report being several "generations" removed from the source document. Clearly, we don't need to all go back to the very first reference on any, but if there are known and easily accessible references that contain the actual information being summarized in this DEIS, it is best to include that source.

Another difference that showed up among the various authors was in the way that they used and reported references. It was clear that some made specific efforts to reference original documents for a given data set and interpret the information in their own words. Other sections just lifted sections of references word-for-word without making it clear that it was an actually a direct quote[8]. There needs to be clear distinction between interpreting the meaning of information in a referenced report and directly quoting from it, so that it is clear from the reader whether the DEIS is providing summaries from previous work or is integrating multiple studies and/or making professional judgments regarding prior research.

It was also clear that the various authors had access to or used different references, or were more familiar with the range of information available. CIRCAC was a participant in multiple Cook Inlet studies, so we'll use an example from our report *Assessment of the Prey Availability and Oil-related Contaminants in Winter Habitat of Cook Inlet Beluga Whales*.[9] This was referenced as a source of information for the water quality section[10] by describing fish tissue contaminant measurements in Cook Inlet beluga whale potential winter prey. However, in a section specifically describing Cook Inlet beluga whale foraging ecology and feeding[11], the report was not referenced, although it provides some of the only information available on potential winter prey near the lease sale.

DEIS Content

In several reports where CIRCAC was an active participant in the research, we see that the DEIS makes generalizations that carelessly interpret the findings and extend them to situations and scenarios that are not supported by the original report. We then must assume that if we note these situations for literature with which we are familiar, it is likely to be occurring for other information sources. These failures in the DEIS point again to the need for a longer review period when many of the local experts who produced the information are available for consultation.

The information contained within the DEIs, and the effort to integrate and interpret that information, is unevenly distributed among the sections. Some of this can be attributed to the lack of information available for some categories, though often the authors are missing the opportunity to better describe available information. For example, for Chapter 3*: Description of the Affected Environment*, there are 40 pages dedicated to describing marine mammals and only 3 pages describing lower trophic level organisms. We recognize that special consideration must

[8] Example from DEIS Salinity section from
[9] 2014. Final Report of Field Surveys and Laboratory Analyses (2011-2013). Report prepared by Cook Inlet Regional Citizens Advisory Council. Kenai AK. Kenai Peninsula Borough. 53 pp
[10] DEIS, Section 3.1.5.2 (subheading The Beluga Whale Study)
[11] DEIS, Section 3.2.3.1 (subheading Foraging Ecology and Feeding)

be given to marine mammals due to their significance under the Marine Mammal Protection Act. However, as recognized in the DEIS, some of the longest-lasting impacts of spilled oil are to shoreline habitats and it is within these habitats where many of the lower trophic level invertebrates reside. And, these shorelines and lower trophic level organisms can play a significant role in the lives of some marine mammals, as well as some terrestrial mammals and birds.

Chapter 3 Comments - Description of the Affected Area

Chapter 3 describes the environment potentially affected by activities associated with the proposed Cook Inlet Planning Area Oil and Gas Lease Sale 244. More specifically, the DEIS Executive Summary states that this chapter "describes the physical environment, biological environment, socioeconomic and sociocultural systems, and oil and gas and related infrastructure of an around Cook Inlet that could be affected by the Proposed Action."[12] This introduction should be provided at the beginning of Chapter 3 (and expanded on), similar to what was provided for the chapter on Environmental Consequences,[13] instead of jumping directly into a description of the physical environment[14] with no introduction or description of what to expect from the chapter. Chapter 3 should also describe very specifically what is meant by "affected area," as it is unclear. For example, for some resources, descriptions are provided for that resource throughout Cook Inlet and areas potentially impacted by lease sale activities nearby or far "downstream." However, others limit the description to the area immediately surrounding the lease sale. The lack of consistency makes it difficult in later DEIS sections where environmental consequences are described.

In addition to differences in the size of the affected areas described, the depth that existing information about affected environment resources is described and integrated is unevenly distributed among sections. Some sections describe temporal and geographic differences or trends, while others provide very general descriptions.

Below we provide some specific comments on Chapter 3 sections.

Section 3.1. Physical Environment

No mention of the Alaska Ocean Observing System (AOOS) data portals[15] are provided as a source of historical and near real-time climate and meteorology data for Cook Inlet. Section 3.1.2.2 should provide a more complete description of bathymetry, noting the wide and shallow Kamishak Bay and the very wide rock ramps and mudflats found especially along the west side of Cook Inlet. Under a later subheading ,[16] there are estimates provided of how much total area is exposed below Mean High Water (MHW) but a general description of the differences in

[12] DEIS, Volume 1, page ES-2.
[13] DEIS 4.1
[14] DEIS, 3.1
[15] www.aoos.org
[16] DEIS, 3.1.3.2. Water Depth and Bathymetry

nearshore bathymetry should be provided under the heading Physiography, Bathymetry, and Geology.[17]

The DEIS describes that an additional 1,616 km^2 of benthic habitat is exposed at Mean Low Water (MLW) when compared to MHW. This is especially significant when evaluating potential impacts of spilled oil because almost all oil that strands on shoreline will do so between MHW and MLW. The DEIS over-simplifies the importance of this as a habitat even though it accounts for almost 8% of Cook Inlet's benthic habitat. The DEIS also minimizes the extent of the incredibly low-angle, wide intertidal habitat found immediately adjacent to the lease sale area by stating that "The majority of these tidally exposed areas are in Knik and Turnagain arms, the Susitna River area, and near the West Foreland."[18] In fact, some of the widest intertidal areas occur in lower Kamishak Bay, immediately south of the proposed lease sale area (Figure 1 below). Much of the west side of Cook Inlet includes extensive wide rock ramps and mud flats.

Figure 1. Wide, low-angle intertidal habitat, Kamishak Bay.

The section[19] on Cook Inlet's salinities describes the findings of a prior study inappropriately. The DEIS states that "The lowest mean salinities (approximately 26 to 28 ppt) and the largest amplitude seasonal salinity signal (approximately 3 ppt) occur between the Forelands" and reference a report by Okkonen *et al* (2009). This statement is provided after describing a north-south salinity gradient that occurs in Cook Inlet. However, that study was referring to the Forelands area having the lowest salinity among the set of transects sampled during the study – all further south than the Forelands transect. As written, the DEIS implies that it is the lowest for Cook Inlet when much lower salinities can be found in surface waters further north in the Inlet.

[17] DEIS, 3.1.2.1
[18] DEIS, 3.1.3.2
[19] DEIS, 3.1.3.3

This may seem insignificant, but the author misrepresents another study (by Okkonen 2005[20]) in the very next paragraph by stating that "the most saline waters (>27 ppt) are at the bottom of the shipping channel and in shallow water adjacent to Kalgin Island." No context for the study is provided and the reader is left with the impression that it refers to Cook Inlet as a whole. What the DEIS fails to note is that the study was conducted at only one transect during one 26 hour period and Okkonen (2005) reported that *during that timeframe and along that transect*, the most saline waters were found at the bottom of the shipping channel and in shallow water adjacent to Kalgin Island. Although seemingly minor, this carelessness does little to engender the reviewer's confidence in the findings of the DEIS.

The section describing Cook Inlet tide rips[21] is missing one of the better references describing the dynamics governing the temporal and spatial evolution of Cook Inlet's tide rips.[22]

Cook Inlet sea ice should be described more fully[23]. No mention of its role in historical Cook Inlet vessel incidents and oil spills in Cook Inlet is provided, such as when heavy ice caused a crack in the hull of the T/V *Chesapeake Trader*, when the T/V *Seabulk Pride* was ripped from its upper Cook Inlet dock in heavy ice conditions, and when the S/V *Monarch* capsized due to heavy ice piling against and on top of it when it was alongside an Inlet platform.

Section 3.1.5. Water Quality

The introduction to this section mentions sediment hydrocarbon concentrations but does not note that there are no state sediment quality guidelines.

The DEIS states that "Based on standard salt balance calculations, 90% of waterborne contaminants will be flushed from the Cook Inlet in ten months (Kinney, Button, and Schell 1969l Kinney et al. 1979).[24] These calculations were done using over 45-year old data and assumptions, at a time when little was known about Cook Inlet's circulation. The assumptions used for these calculations should likely be revisited. Currently, the DEIS makes no attempt to explain how these calculations were made and on what data they were based, though the idea that all contaminants will be swept out of the Inlet is repeated regularly throughout the DEIS. New residence time estimates should have been calculated and presented in the DEIS. Additionally, the DEIS statement that "because tidal turbulence is the major mixing process in this estuary, rather than seasonally varying freshwater input, the flushing rate is relatively invariant over the course of the year" is in direct opposition to what we know about Cook Inlet's *net* circulation. Turbulence implies mixing, whereas flushing implies transport. Thus, this second statement is in direct conflict with itself. It's also becoming clearer that there are significant seasonal differences in stratification in parts of the Inlet, along with significant seasonal

[20] Okkonen, Steve. 2005. Observations of hydrology and currents in central Cook Inlet, Alaska during diurnal and semidiurnal tidal cycles. OCS Study MMS 2004-058. Fairbanks, AK; UAF, CMI.
[21] DEIS, 3.1.3.6
[22] Chapter 4 in: Johnson, M. A .2008. Water and Ice Dynamics in Cook Inlet. Final Report. OCS Study MMS 2008-061. University of Alaska Fairbanks Coastal Marine Institute and USDOI, MMS, Alaska OCS Region, 106 pp.
[23] DEIS 3.1.3.7
[24] DEIS, 3.1.5.1

differences in freshwater influx (and thus the strength of the southward flowing Cook Inlet western boundary current). Both will likely influence residence times. There is also buoy drogued and surface buoy data for Cook Inlet that implies differences in residence time for different parts of the Inlet. For example, buoys deployed by Johnson (2008) were shown in some instances to spend weeks within a very small < 30 km section of the Inlet, but could suddenly sweep south and out of the inlet within days.

Residence time is an important factor and has many ramifications for discharge plume modeling and deserves a more thoughtful approach than generalizations about the "relatively rapid flushing." While data likely support that hydrocarbon and metal contaminants entering the Inlet from anthropogenic sources are overwhelmed by the natural contaminants in the massive volumes of sediment and water entering the system, without providing the basis of calculations to estimate mixing, dispersal, and/or flushing rates, a DEIS should provide justification for statements such as "pollution entering the system may be rapidly diluted and dispersed."[25] Now would be a great time for BOEM to support calculation and assessment of these numbers based on newer information instead of relying on a 46-year old estimate.

NOAA threshold values for nutrients should be defined.[26] The authors should make an attempt to put the data they are referencing into meaningful context. For example they state the "at the bottom across all sites, the nitrogen to phosphorous ratios were much closer to 16:1." How is that meaningful to the reader; explain the meaning of the Redfield Ratio.

The DEIS states that "Previous studies have found no evidence of heavy metal pollution in lower Cook Inlet, but some evidence for elevated mercury (Hg) in water and sediment, especially in the upper Cook Inlet, perhaps introduced by runoff (Segar, 1995). In general, the Saupe, Gendron,and Dasher (2005) study echoed these findings."[27] This is untrue. The data shown for Hg in that report does not show elevated concentration in upper Cook Inlet. Perhaps the authors were referring to the earlier part of that sentence about finding no evidence of heavy metal pollution in lower Cook Inlet. However, that is not how that sentence reads.

The description of hydrocarbon constituents[28] is unfortunately missing a valuable data resource for Cook Inlet contaminants (this applies to heavy metals as well as other sediment and water quality parameters). The National Pollutant Discharge Elimination System (NPDES) Cook Inlet Oil and Gas General Discharge Permit AKG-31-5000 required a fate and transport study from large-volume produced water discharges in Cook Inlet. In 2008 and 2009, a series of studies were conducted to characterize the chemical, biological, and physical environment of Cook Inlet. The combined studies were called the Integrated Cook Inlet Environmental Monitoring and Assessment Program (ICIEMAP)[29] and was a collaboration between industry, EPA, NOAA, and

[25] DEIS, 3.1.5.1
[26] DEIS, 3.1.5.2 Water Quality in Cook Inlet: Nutrients
[27] DEIS, 3.1.5.2.Water Quality in Cook Inlet: Sedimentary Trace Metals
[28] DEIS,, 3.1.5.2. Water Quality in Cook Inlet: Hydrocarbon Constituents
[29] http://www.circac.org/what-we-do/biological-chemical-monitoring/environmental-monitoring-and-assessment-program-iciemap/

CIRCAC. The data was shared amont all partners and industry submitted much of the data for their required report to EPA[30] which was a requirement of their discharge permit. Unfortunately, EPA may not have provided this report to the DEIS authors during their consultation. The significance of the report is that the studies used a statistical design such that the results would characterize Cook Inlet conditions. In contrast, the report relied upon for much of the water quality section (Saupe, Gendron and Dasher 20005) was designed to characterize all of southcentral coastal bays and estuaries and not specifically Cook Inlet. Though numerous locations were sampled in Cook Inlet, the data did not quantitatively characterize the Inlet, though the data provide descriptive information that has led to the development of other projects, such as the Cook Inlet EMAP project called ICEMAP.

The DEIS states that "Boehm et al. (2001) collected sediment samples in the outer portion of the Cook Inlet (Shelikof Strait) and found that the concentration of hydrocarbons has not increased appreciably since the introduction of oil exploration in Cook Inlet."[31] This is misleading as it implies that the researchers had been sampling since oil exploration began. This needs clarification that it was based on dating sediment layers in core samples. In the next paragraph, the sentence "However, Wetzel (2010) showed PAHs were present in the upper Cook Inlet…" is misleading in that it implies that hydrocarbons were not either found earlier in the upper Inlet or in the areas describe in the previous section. The fact that Boem et al (2001) did not find that hydrocarbon concentrations had increased, did not mean that they found no hydrocarbons in the sediments. Every single sediment sample analyzed as a component of a Cook Inlet sediment study has found hydrocarbons. They are ubiquitous in the Inlet, and worldwide. The significance is in the concentrations and sources.

Section 3.2 Biological Environment

This section was very unevenly described, with incredible detail provided for some resources and very little information summarized for others. Lower trophic levels were[32] summarized in 3 pages, though the category encompasses phytoplankton, zooplankton, and both intertidal and subtidal communities. Little attempt was made to describe meaningful temporal and spatial trends for phytoplankton and zooplankton in the Inlet and in areas potentially impacted by lease sale activities. As far as potentially impacted area, the focus was on Cook Inlet only, The limited discussion on temporal and spatial trends missed the opportunity to describe "hotspots" and the site-specific upwelling that drives primary and secondary production in some areas, such as found between the Barren Islands and Shuyak Island where the high zooplankton assemblages support feeding humpback whales for months each summer. Also, further discussion on the potential transport of phytoplankton from areas of known high *in situ* productivity in the Inlet to other areas was missing. There was also no recognition in this section about the role that regime shifts may play in the transport of primary or secondary production may play in supporting benthic communities.

[30] KLI. 2010. Produced water discharge fate and transport in Cook Inlet, 2008-2009: NPDES Permit NO. AKG-31-5000. Final Report submitted to USEPA and ADEC, Anchorage, AK. 282 pp.
[31] DEIS, 3.1.5.2. Water Quality in Cook Inlet: Hydrocarbon Constituents
[32] DEIS, 3.2.1

Fucus sp. is not a green alga.[33] Rather,it is in the Class phaeophyceae,(brown algae). This section also poorly describes spatial trends in both intertidal and subtidal algae and invertebrates. There is an unfortunate paucity of detailed algae and invertebrate data published for Cook Inlet. However, the DEIS does miss several resources that describe distributions of some of the more important prey species for feeding birds and marine mammals, such as the deposit-feeding clam,*Macoma balthica*[34] and the larger *Mya arenaria* and other clams[35]. The differences in intertidal communities spatially are barely touched on with no mention of the very large differences between the upper and lower Inlet. Also, the DEIS needs to better define "shallow" and "deep" subtidal communities. The Deep Subtidal Communities section is written as if the author is unaware of the "Regime Shift" described for Cook Inlet. It describes shellfish in Cook Inlet as if crabs are still the major diets of commercial fish species. Later in the report (under shellfish resources) in a different section, that author recognizes the significant shifts in benthic communities away from crabs and shrimp.[36] There is such little information provided that, as described, the sections on benthic communities are of limited use in later evaluating relative environmental consequences to these resources.

Fish and Shellfish are described in Section 3.2.2. The species descriptions for much of this section are generalized and could read the same for any place in Alaska, except for limited mentions that they occur in Cook Inlet. In later sections (*e.g.* birds), attempts are made to describe forage fish as a source of seabird prey. The Pelagic Fish section[37] should also make an attempt to better describe the temporal and spatial distribution of forage fish species *(e.g.* Longfin smelt, Pacific herring, Pacific sand lance) in the lease sale area, and describe them in the context of the timing and distribution of their lower trophic level prey. Benthic fish descriptions are missing for anything other than commercially important species, except for the "Other Groundfish" section which describes these species in a two sentence paragraph,[38] despite their roles in the Cook Inlet Planning Area ecosystem. The distributions of these non-commercial fish are important as they can be significant prey for resident Cook Inlet species (*e.g.* starry flounder for beluga whales). Also an overall summary of the very real spatial and temporal differences in overall fish biomass in Cook Inlet is warranted. High populations of Walleye Pollock and Pacific Cod were recently reported (and commercially fished for a very limited operner) in Kachemak Bay, though these species are not found in nearly that abundance elsewhere in the Inlet. Very little information is available for winter resident fish in the Inlet. However, no attempt was made by the authors to seek and summarize out information that is available.

[33] DEIS, 3.2.1.2.Benthic Communities: Intertidal and Shallow Subtidal Communities
[34] Gill, R. E., Jr., and T. L. Tibbitts. 1999. Seasonal shorebird use of intertidal habitats in Cook Inlet, Alaska. Final Report. U. S. Department of the Interior, U.S. Geological Survey, Biological Resources Division and OCS Study, MMS 99-0012, 55 pp.
[35] e.g. Lees, D.C. 2006. Guide to intertidal bivalves in southwest Alaska national parks. National Park Service, Anchorage, Alaska. NPS/AKRSWAN/NRTR-2006/02. The guide can be accessed at the following web address: http://www.nature.nps.gov/im/units/swan/Libraries/Reports/LeesD_2006_SWAN_GuideIntertidalBivalves_630223_small.pdf
[36] DEIS, 3.2.2.3
[37] DEIS, 3.2.2.1
[38] DEIS, 3.2.2.2.Groundfish: subheading Other Groundfish

The shellfish section, 3.2.2.3, is particularly poor at providing the information in the context of Cook Inlet. The provided summaries are almost exact replications of ADF&G state-wide descriptions, with no effort to interpret that information in the context of Cook Inlet and nearby areas. For example, where in the planning are the highest concentrations of these species? How and where are larvae advected into Cook Inlet? Some of this information is readily available, but other may require interpretation of the species data with knowledge of circulation patterns and prey distributions. Weathervane scallops deserve a more detailed description of their populations and trends in Cook Inlet and nearby areas. Also, note commercial areas adjacent to Cook Inlet. The description for razor clams is lacking, especially given its recent population crashes on the east side of Cook Inlet. Oddly, the DEIS describes the distribution of razor clams in Cook Inlet by saying "Large assemblages of razor clams occur in waters near Augustine Island of western Cook Inlet. Additional large assemblages of razor clams inhabit Kachemak Bay." In recent history, concentrations of razor clams have been in the Ninilchik/Deep Creek, Polly Creek, and Chinitna Bay areas, which are not mentioned at all and I am unaware of any current large assemblages near Augustine Island or Kachemak Bay. There was no discussion about other hardshell clams species, such as Little neck clams (*Leukoma staminea*) or butter clams (*Saxidomas giganteus*) – both having had commercial, subsistence, and recreational pressure in lower Cook Inlet near Port Grahm and in Kachemak Bay. Other than noting that they occur on rocky habitat, there is also no discussion about mussels (*Mytilus trossulus*) or katy chitons (*Katharina tunicate*), both important subsistence species for the lower Cook Inlet communities of Port Graham, Nanwalek, and Seldovia. Subsistence harvesting areas of all four of these bivalves and polyplacaphoran were impacted by the *Exxon Valdez* oil spill and extensive research followed.

Chapter 4 Comments – Environmental Consequences. (and including Oil Spill Trajectory Analyses (Appendices A and B))

This section is difficult to clearly evaluate because we have a concern about the basic methods described for the oil spill risk analyses, including how oil was transported in the oil spill trajectory model. Despite those concerns (which will be described below), we provide the following comments regarding potential environmental consequences as a result of activities associated with the proposed lease sale.

Section 4.1. Impacts Scale and Analyzing Potential Impacts at the Lease Sale Stage

The DEIS states that "Analysts used the best available information and their professional judgment to determine where a particular effect falls in the continuum on a relative scale from "negligible" to "major," with the impacts that fall in the "major" category considered "significant." Given the lack of temporal and spatial descriptions for many of the physical and biological resources described in Chapter 3, it is unclear how "best professional judgment" was integrated with that information to classify impacts as negligible, minor, moderate, or major. How was the data compiled by some authors interpreted and used by those evaluating environmental consequences? Was the physical and biological resource information provided in

a geospatial format so that the analysts could integrate species distributions at the scale of shoreline segments?

It is unclear how the various impact combinations of detectability **x** duration **x** spatial extent **x** magnitude are integrated and weighted to determine where a particular effect falls in the continuum on a relative scale from "negligible" to "major." Are they equally weighted? And how are attributes such as the distribution, life history, and susceptibility of individuals and populations to impacts factored in? These are important distinctions, as only those determined to be "major" impacts were considered significant.

Section 4.2. Impact-Producing Factors for Routine Activities

The potential impacts of some "Impact-Producing Factors" are dependent on the proximity of the resource to the factor and in other cases on the transport pathways delivering the factor to the resource. In other words, for many of the analyses, a solid understanding of Cook Inlet's physics is required, as well as the ability to accurately model it. This is crucial, since impact scaling relies on spatial extent for impact classifications, meaning that in addition to having a solid understanding of each resource, accurate trajectory analyses are critical.

The Impact Matrix (Table 4.2-1) should include a potential impact symbol at the intersection of "Drilling Dishcharges" and "Coastal and Estuarine Habitats." Fine sediments are deposited in nearshore eddies and at depths < 10 m in many nearshore areas of western Cook Inlet, such as Tuxedni, Chinitna, Iliamna, Iniskin, Bruin, Oil, and Akumwarvik,bays, and the circulation patterns described in Chapter 3 do not preclude deposition of the finer components of drilling muds and cuttings to those areas. No 3-dimensional modeling is provided to demonstrate possible discharge plume trajectories for the range of potential discharge locations associated with the lease sale. And plumes and transport modeling that has been done for upper Cook Inlet does not translate to lower Cook Inlet, as circulation and tidal currents are significantly.

Drilling Discharges[39] would likely include drilling fluids and drill cuttings discharged to Cook Inlet during the Exploration stage, and as such are subject to National Pollutant Discharge Elimination System (NPDES) permits, administered by EPA. The current permit does not allow for discharges of drilling fluids and cuttings during development and production. However, that does not preclude future approvals for discharging during those stages. As a condition of any lease sale, a requirement should be established that all drilling discharges from development and production wells would be reused, reinjected, or shipped to shore. CIRCAC's comments to EPA on the draft version of the current Cook Inlet General Oil and Gas NPDES permit (AKG-31-5000) included a statement that the Cook Inlet RCAC opposes "the issuance of an NPDES General Permit for Oil and Gas operations in Cook Inlet that would allow more pollution to be discharged than is currently permitted and the Cook Inlet RCAC supports the goal of zero discharge."

[39] DEIS, 4.2.2

The DEIS applies the results from other coastal areas to potential locations of drilling fluids and cuttings discharges in Cook Inlet by saying that "In shallow environments, WBFs [water-based fluids] disperse rapidly in the water column and particulates quickly descend to the seafloor immediately after discharge, causing periodic minor increases in turbidity (Neff 2010); in deeper water, fluids discharged at the sea surface are dispersed over a wider area (Neff 1987)." In the environment of Cook Inlet where tidal currents vary considerably between spring and neap tides and among different areas of the Inlet, these are over-simplifications of potential discharge plume trajectories and sediment transport and deposition. In the absence of plume models based on best available data for the Cook Inlet lease sale area, it is hard to evaluate whether the 3,045 to 4,350 tons of drilling fluids and 5,220 to 7,470 tons of rock cuttings estimated to be discharged during exploration activities[40] would actually be "quickly transported away by strong currents," as described in the DEIS.

For Other Operational Discharges[41], the DEIS notes that "The extended 2007 General Permit AKG-31-5000 prohibits discharge in new production areas of produced water and sand during development drilling or production activities." Given that demonstrations in Cook Inlet proving that the geologic formations can accept injected waste stream, the lease sales should specifically identify the prohibition of these discharges as a condition of the leases.

Geohazard sampling plans and survey results should be required to be publically noticed[42].

Chapter 4. All sections related to Oil Spill Modeling (Accidental Oil Spills)

Our comments here pertain to sections where oil spill trajectories are used to estimate potential impacts to the environment from oil spills of various sizes. The assumptions used for the purposes of environmental effects analysis of the Proposed Action or its alternatives

Oil Weathering

The DEIS simulation results for oil weathering[43] for a 5100 bbl crude oil winter spill (as presented in Table A-1.4) show that the SINTEF model results differ from what is produced using ADIOS2, the oil spill weathering model often applied at Incident Command for oil spills in the U.S. For a 5100 bbl spill crude oil using a similar API and the winter wind, wave, and water conditions described for the winter spill scenario, the ADIOS2 prediction show that 24 hours into the spill differs from the SINTEF results. ADIOS2 shows significantly less oil dispersed at any time (e.g. 6% dispersed after 3 days using ADIOS2 and 30% dispersed reported by the SINTEF model). Please provide a description of the drivers and assumptions that are used by the SINTEF oil weathering model to predict evaporation and dispersion. A discussion of biases (or removal of biases compared to other models), especially for conditions specific to Cook Inlet, would help explain differences produced by the two models (*e.g.* why does the SINTEF model estimate

[40] DEIS, 4.2.2 Drilling Discharges
[41] DEIS, 4.2.3
[42] DEIS, 4.2.5.1.
[43] DEIS, A-2.5.2 Crude Oil and Diesel Fuel Simulations of Oil Weathering

higher dispersal – though it's probably more realistic, given the wind, waves, and turbidity of Cook Inlet?

Shoreline Type, Oil Behavior, and Persistence

This section (A-2.2.2) describes shoreline oil-retention characteristics for Cook Inlet and adjacent areas. However, the description of the areas being defined is confusing. For example, under Section A-2.2.2, the DEIS seems to describe the Oil Spill Risk Analysis (OSRA) study area as being "Cook Inlet/Shelikof Strait," yet Table A-2 and a later section (A-3,1,1 Study Area and Boundary Segments) both include Cook Inlet, Shelikof Strait, Kodiak Island, the southern Alaska Peninsula, as well as areas upstream of Cook Inlet along the Kenai Peninsula, the western Gulf coast, and western Prince William Sound. It is unclear why the OSRA is including areas far upstream of Cook Inlet, where oil spilled from lease sale activities could not be impacted from the spilled oil. Is the reasoning for this purely to increase the number of and distances to boundary segments? It/s not clear, however, how this would benefit the OSRA since oil would not be transported to those upstream boundaries.

Though confusing here, it becomes clearer later in the Appendix that the OSRA does include all of those areas, but because of the confusion in how the ESI information is discussed in A-2.2.2, it is unclear if the percentages described for the main ESI types are for Cook Inlet/Shelikof or for the entire coastline along the OSRA. If it is for the entire OSRA, then it seems that the percentage of tidal flats, which are common on the west side of Cook Inlet and in southern Kamishak Bay, would be lower than if the percentages were based on Cook Inlet and Shelikof only.

It is also frustrating that this analysis is based on the data provided by Gundlach et al (1990). One of the reasons that the Alaska ShoreZone Program was initiated in Cook Inlet was that the EIS data for Cook Inlet was of low resolution, hadn't been obtained during the lowest tides, did not provide detailed across-shore data, and did not map biological habitat. Additionally, both the EIS type and Alaska ShoreZone's calculated "oil residence index" are based on the dominant habitat for a given shoreline segment. However, as described in Chapter 3,[44] the intertidal range for much of the western Cook Inlet and Kamishak Bay areas have extremely wide tidal ranges and multiple habitats shoreline types can occur across-shore within a shoreline segment. In this way, the analysis is missing the fact that a habitat type could be under-represented as a percentage of a land segment. For example, a shoreline segment could have a rock cliff that extends into the upper intertidal zone, a steep gravel beach face that ranges from the high intertidal zone to zero tide, and a wide mud flat below MLW. During ESI and ShoreZone mapping, the coastal mapper is interpreting imagery and making a judgment call as to which

[44] DEIS, 3.1.3.2

combination of those across-shore habitats will define ESI type or ShoreZone's BC coastal class[45].

The Environmental Sensitivity Indices (ESI) of defined Land Segments are provided in Table A-2 and described in Section A-2.2.2, but the description of what a Land Segment is and how it is created is not presented until later in the report and in Table A-17. Compiling the ESI data into the seemingly arbitrary 20-25 km segments is also confusing. I assume the justification for doing this was to create a more manageable number of segmented shoreline inputs uploaded to the oil spill trajectory model and minimize the output list of potential oil contact locations (resource area, boundary segment, land segment, and grouped land segment). However, can this potentially minimize or maximize a type of habitat, for example in a Grouped Land Segment?

The reasoning for how the timing of the vulnerability for Environmental Resource Areas (ERAs), Land Segments, and Grouped Land Segments was determined is not clear. For example, why is ERA 10 SUA: Old Harbor most vulnerable in December and January for the specific resources identified (salmon, halibut, steelhead, seals, sea lions, clams, and crabs). Is this a function of when the oil is most likely to be transported to that shoreline, rather than a particular sensitivity of the species' life cycles during those months?

The most confusing aspect of the OSRA is where one of the oil-spill trajectory model assumptions is "The oil spills are simulated each as a point with no mass or volume"[46] such that the "hundreds of thousands of simulated trajectories give a statistical representation, over time and space, of possible transport under the range of wind, ice, and ocean-current conditions that exist in the OSRA study area."[47] So it seems that each individual model run treats the spill as a "parcel" of water that follows Lagrangian circulation from the source to the end of the model run, either when 30 days runs out (in the case of large oil spills), when it reaches a boundary, or when it reaches a Land Segment. This seems antithetical to what an oil spill trajectory analysis is designed to project, which is the aerial spread of an oil spill from its initial "point source" so that the aerial extent of the oil plume gives a more realistic estimate of potential areas impacted.

In earlier oil spill trajectory model simulations for Cook Inlet (though not as sophisticated in terms of transport, especially in capturing baroclinicity), we could see both the entire plume as well as the center of mass. Each spill, regardless of whether it is a bulk or continuous spill was represented by 1,000 white dots with another symbol representing the centroid or center of mass of the spill. . Often, "tongues" of the slick that constituted a significant portion of the slick could break away and ground, while the center of mass stayed in the center of the Inlet and was transported along the long axis of Cook Inlet, with little "net" transport west or south for weeks. It may be a misinterpretation of how the oil spill trajectory model is described, but as it reads, it

[45] Harper, J. R. and M. C. Morris. 2014. Alaska ShoreZone Coastal Habitat Mapping Protocol. Prepared by Nuka Research and Planning Group LCC, Seldovia, AK., for the Bureau of Ocean Energy Management (BOEM), Anchorage, AK. 164 pp. httep://alaskafisheries.noaa.gov/shorezone/chmprotocol0114.pdf
[46] DEIS, A-3.2
[47] DEIS, A-3.3

appears that the trajectories are not modeling surface plumes. If so, it seems that shoreline impact probabilities, especially closest to the spill location, would be minimized.

All of the oil spill trajectory analyses results are presented in tables. It would have been useful to see probability maps that summarized results; in effect, visually delivering what the DEIS promised which was "the hundreds of thousands of simulated trajectories [will] give a statistical representation, over time and space, of possible transport under the range of wind, ice, and ocean-current conditions that exist in the OSRA study area.".

The "annual probabilities" for oil spills initiated at a given location and ending up at a particular Environmental Resource seem *overly* weighted towards areas adjacent to the spill. Unfortunately, the literature sources referenced for the Cook Inlet circulation model used for the OSRA and for how it tabulates the percent chance of an oil-ERA interaction have both yet to be published (Ji, Johnson and Smith, 2016. in prep[48]; Danielson S. *et al*. 2016. In press).[49] The information contained within these documents are the basis for much of the OSRA work and they should have been made publically available in the docket as Supporting Documents during the public comment period.

While the higher probabilities for resource areas nearer the spill location seem logical for most scenarios, drifter buoy data indicate that the speed that a surface (or even subsurface) particle would be transported differs wildly for different parts of the Inlet. Consistently, tidal currents measured near the Forelands have been some of the highest measured for Cook Inlet. However, while buoys can have a very long tidal excursion near the Forelands, they can also have very little net movement – sometimes even for weeks. Numerous drifter tracks show buoys "trapped" in the Inlet for weeks and suddenly a shift in wind or some other environmental variable allows them to break out of a convergence zone or eddy and they can be swept out of the Inlet within days. A series of these buoy tracks are provided in Figure 2 below to illustrate why it seems that the OSRA is underestimating the probabilities of oil being transported to areas far downstream, especially if the spill took place in the Hypothetical Launch Area 5 or Pipeline Number 3 in Map A-5.

The researcher[50] also used a Regional Atmospheric Model System (RAMS) to produce wind forcing fields to drive the ocean model simulations and noted, when compared to wind measurements, the RAMS failed to predict a relatively large wind event and seemed to have troubles capture the right direction during air-frontal passages. He concluded that the buoyancy and wind-driven circulations play a critical role for the particle trajectories and water transport in Cook Inlet, but that without improvement in the meteorological forcing fields, it will be impossible to simulate accurately the trajectories of drifters [or potentially spilled oil?] in the

[48] Ji, Z., W.Johnson, and C. Smith. In prep. Oil-Spill Risk Analysis: Cook Inlet Planning Area, OCS Lease Sale 244. OCS Report BOEM 2016-0xxx. Herndon, VA; USDOI, BOEM, XXX pp.
[49] Danielson, S., K. Hedstrom, and E. Cruchitser. In press. Cook Inlet Circulation Model Calculations, Final Report. BOEM OCS Study 2015-050. Anchorage, AK: USDOI, BOEM, Alaska OCS Region. 141 pp/
[50] Johnson, M. A .2008. Water and Ice Dynamics in Cook Inlet. Final Report. OCS Study MMS 2008-061. University of Alaska Fairbanks Coastal Marine Institute and USDOI, MMS, Alaska OCS Region, 106 pp.

region. It's difficult to evaluate if the modeled oil spills for the Cook Inlet lease Sale 244 DEIS are reflecting known circulation patterns in the Inlet by looking at a stack of tables in the Appendix.

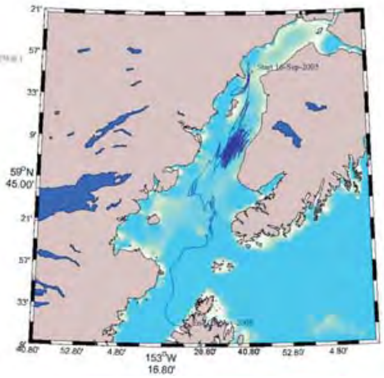

Figure 2a. Trajectory of satellite drifter buoy released in upper Cook Inlet. Note that once it reached the lower Inlet it was swept out of the Inlet within about a week after weeks of little to no net transport.

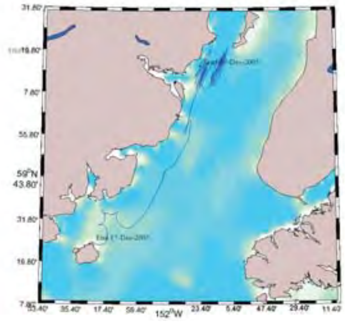

Figure 2b. This buoy was quickly swept downstream to Augustine Island following days with little net transport south in the prior week.

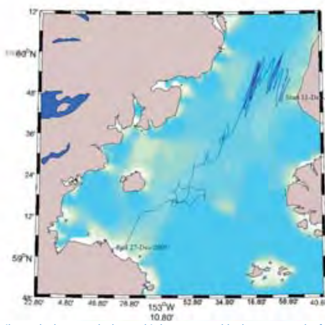

Figure 2c Similar to the buoy track above, this buoy was suddenly swept south after spending over ten days with a slight westerly net transport and almost zero net southerly transport.

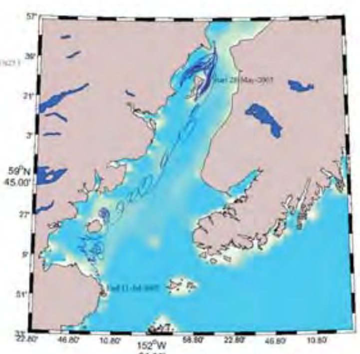

Figure 2d. This buoy was swept into Kamishak Bay after spending weeks north of Kalgin Island in Cook Inlet.

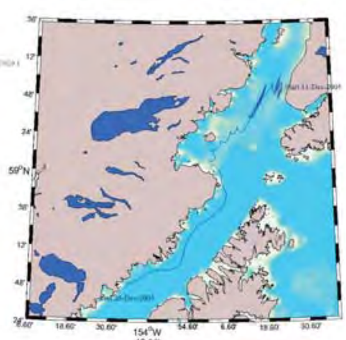

Figure 2e This buoy grounded the day after Christmas, 2005 near Puale Bay on the Alaska Peninsula within two weeks of being released in central Cook Inlet.

Environmental Non-Governmental Organizations

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The DEIS concludes that oil and gas production in Cook Inlet would contribute to global climate change which would affect long-term productivity of the marine and coastal environment of Cook Inlet (4.10) Now is the time to put the health of the Cook Inlet ecosystem ahead of oil and gas development and focus on developing sustainable, renewable energy sources. The DEIS presents overwhelming evidence in support of the No Action Alternative 2.

BOEM Impact Scale

The Impact scale used in the DEIS is at best very conservative. A "moderate" impact is described as "long lasting and widespread, and less than severe." A "major" impact is defined as "severe", and this term is not defined further but we infer that such an impact would be catastrophic. Given the Impact Scale definitions, we propose that any impact in the DEIS described as "moderate" should be grounds for support of the No Action Alternative 2.

Oil Spills

Oil spills, small and large, are a preeminent concern posed by oil and gas development in waters as rich in marine life as the Cook Inlet. The BOEM analysis assumes there is a 22% chance of a large spill over the lifetime of the Oil and Gas leases. (Section 4.1.1) We initially found it odd that the BOEM analysis considers the impacts of only one large spill and terms the occurrence as "unlikely." We do not consider a 22% probability to mean a large spill is "unlikely." Realistically however, one spill is all it would take to impose severe and irreversible damage to the Cook Inlet ecosystem. Specifically, the DEIS lists the following impacts resulting from a large spill (2.8.1):

- The impacts of a large spill to coastal and estuarine habitats could be **major**, depending on the location.
- The impacts to birds from large spills are expected to be **moderate to major**.
- Impacts to pelagic fishes that are important for commercial harvest and sale are long lasting and widespread [**moderate**], especially if important habitat areas were to become contaminated from a large oil spill.
- Impacts from a large spill could cause severe and thus **major** effects to subsistence harvest patterns.
- Impacts to water quality and coastal habitats and natural resources of the Cook Inlet region are expected to be **major**.

The conditions of a large oil spill are the only area of the DEIS analysis resulting in impacts rated as "major" or "severe." Given the significant probability of a large spill (22% is not immaterial as assumed in the DEIS) and the major impacts, the Proposed Alternative must be avoided at all costs. Because the risk of a large spill is ever present, we assert that the only reasonable conclusion from the DEIS is the No Action Alternative 2.

Water Pollution

The DEIS assumes 4350 tons of drilling fluids and 7470 tons of dry rock cuttings per exploration well will be discharged to the seafloor- and will supposedly be carried away by strong currents. (Section 4.3.2.2) Any amount of discharge into the Cook Inlet is unacceptable. The upper Cook Inlet is full of oil and gas wells all of which discharge drilling fluids and chemicals into the Inlet. If

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the discharge from the proposed oil and gas leases is expected to have a minimal cumulative impact (ES-6), that means there is already too much oil and gas related discharge in the Inlet! While the BOEM analyzes short term impacts of discharges on water quality and habitats, the DEIS cannot fully consider the long term impacts of these pollution factors.

We find it incongruous that the DEIS considers that discharges from drilling and related operations would dissipate rapidly due to tidal actions, yet the chances that oil from a large spill would reach Shelikof Island or Kodiak is negligible! (<2%, pp. 4-34) If tidal actions in the Inlet would quickly spread discharged materials, it follows that these same tidal actions would quickly spread oil from a large spill. The DEIS conclusion that a large spill may result in moderate- long lasting and widespread- impacts to water quality indicates that the No Action Alternative 2 is appropriate. (4.3.2.6).

Acoustic Impacts

It is becoming well documented that noise, both explosive and ambient, can have significant effects on wildlife. The BOEM identifies acoustic impacts from seismic activity, vessel traffic, drilling, production platform noise, aircraft traffic and increased noise from clean-up activities should a spill occur. (4.2.5) While the DEIS contains a discussion of acoustic impacts to fish and wildlife, this discussion does not, and cannot given the timeframe, assess long term impacts to the Cook Inlet ecosystem.

Marine seismic and geohazard surveys would be conducted during the spring to late fall seasons thus especially affecting migratory species (salmon and whales). The DEIS states that physical and physiological impacts, hearing impairment, and behavioral effects on fish and fish prey could occur at all water depths of the proposed Lease Sale Area (4.3.5.5) The BOEM assessment for wildlife impacts is that while individuals may be severely impacted, populations as a whole will not be. We challenge this line of thinking and suggest instead that populations become endangered after repeated long term impacts to individuals.

Drilling noise is less intense but more stationary and persistent than seismic activity noise. (4.3.5.5) The DEIS states that a potential stationary zone of displacement around the drill site, if located in important spawning, fish-rearing, or feeding habitat, would negatively impact fish over time. Such noise could lead to physiological and behavioral disturbances. The BOEM concludes that fish would become habituated to these noises. We note that habituation can have negative impacts by allowing fish to remain close to the sound source which prolongs stress and the resulting behavioral and physiological impacts.

According to the DEIS, fishes inhabiting or transiting the proposed Lease Sale Area could be subjected to noise from offshore vessel traffic throughout all phases of the Proposed Action. (4.3.5.5) Vessels cause a path of physical disturbance in the water for a prolonged period and this could affect the behavior of fish species and potentially injure or kill non-swimming and weakly swimming fish life stages and fish prey. Vessel traffic would persist due to servicing of platforms and also construction of pipelines. These potentially harmful impacts would persist for the 33 year life of the Proposed Action.

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Acoustic impacts to marine mammals are varied and are becoming better documented. Lower Cook Inlet is home to the endangered Beluga whale and is on the migratory path of other whale species. Seals and endangered otters also inhabit the area. Below are some of the known impacts to marine mammals from acoustic disturbances:

- strandings and other non-auditory physical injuries;
- temporary or permanent loss of hearing, which impairs an animal's ability to communicate, avoid predators, and detect and capture prey;
- avoidance behavior, which can lead to abandonment of habitat or migratory pathways;
- disruption of biologically important behaviors such as mating, feeding, nursing, or migration, or loss of efficiency in conducting those behaviors;
- aggressive (or agonistic) behavior, which can result in injury;
- masking of biologically meaningful sounds, such as the call of predators or potential mates;
- chronic stress, which can compromise viability, suppress the immune system, and lower the rate of reproduction;
- habituation, causing animals to remain near damaging levels of sound, or sensitization, exacerbating other behavioral effects; and
- declines in the availability and viability of prey species, such as fish.

Again, the BOEM concludes that impacts from noise would affect a number of individuals but not entire populations. We find this continued line of reasoning to be inadequate as it ignores the fact that wildlife populations can become endangered as a result of repeated, cumulative impacts to subsets of the main population. Harmful effects to wildlife are not acceptable and, again, the No Action Alternative 2 is the logical conclusion for this analysis.

Impact to Fishing

In general, the BOEM notes that the Proposed Action will affect the abundance and catchability of fish, create loss of access to fishing grounds and damage or loss to fishing equipment. We suspect that the BOEM may apply its criteria for wildlife impacts to fishermen and conclude that the impacts to commercial fishermen will affect individuals and not the entire population so the impacts should be acceptable! Of course, this is nonsensical, especially if you are the fishermen impacted. We find it unacceptable that the oil business should trump the fishing business.

The BOEM states that the physical presence of production platforms near riptide locations could have a localized but long-term impact on the drift gillnet fishing industry. The BOEM further states that commercial fishers would simply be able to use alternative fishing grounds during times of space-use conflict. (2.8.1) Unfortunately, Alaska regulations designate the boundaries for the gill net fishery and THERE ARE NO ALTERNATIVE fishing grounds! (5 AAC 21.330) Fishermen with a limited time to make their annual income would consider space-use conflict to be a major and severe impact!

The BOEM's expected impact to commercial fishing from a large oil spill is "moderate" as a consequence of reduced catch, loss of gear, and/or loss of fishing opportunities for an entire

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season. The raters of the various impacts analyzed in the DEIS obviously were not fishermen. The described impacts from a large oil spill would be devastating to fishermen and the proposed Alternative 5 does not eliminate these impacts. Therefore, any conclusion other than the No Action Alternative 2 is unreasonable and unacceptable.

Impacts to Critical Habitats

The BOEM addresses impacts to the various critical habitats, for beluga whales and northern sea otters, by presenting Alternatives 3 and 4. These Alternatives either remove affected blocks from the lease area or prohibit drilling activities during certain times of the year to reduce impacts to endangered species. Since the Alternative 3 and 4 scenarios address critical habitat areas, endangered species, and fish species that must not become endangered (our salmon), they should be imposed if the lease sale goes forward. It should be noted that these Alternatives, together with excluded areas under Alternative 5, effectively close over 50% of the lower Cook Inlet to oil and gas activities, such that there would be no economic gain to be had from development. Again, the No Action Alternative 2 provides the logical conclusion to the DEIS analysis.

Cumulative Impacts

Unfortunately, the BOEM does not analyze the cumulative effects of the proposed activities except to say that their contribution to existing impacts will be "quite small." No explanation for this conclusion is provided. According to the DEIS, the resources with the greatest potential to experience cumulative effects include marine mammals, birds, coastal and estuarine habitats, commercial fishing, subsistence harvesting patterns, recreation and tourism and visual resources, and areas of special concern.(ES-6) A true assessment of the contribution of the proposed activities to the cumulative impacts from all Cook Inlet activities would require an assessment of the total impacts from all oil and gas activities in the Inlet. It is obvious to us that the continued assumption by oil and gas development proponents that the cumulative effects of each additional project is "quite small" will lead us eventually to environmental crisis. The time to stop these cursory assessments is now, with this proposed lease sale. Again, the No Action Alternative 2 is the right decision.

Conclusions

The DEIS lists enough impacts to the lower Cook Inlet to justify the No Action Alternative. Specifically listed are disruptions from routine drilling operations, discharge of air pollutants; discharge of water pollutants; increased underwater noise from seismic testing, drilling and support vessels; and exclusion zones around rigs that limit or preclude fishing activities- both sport and commercial. (Table ES-1). If these disruptions are not enough, the DEIS acknowledges the potential for a large oil spill at some point during the lifetime of the operations. Much as the BOEM seeks to minimize the likelihood of a large spill, that potential will always exist. The potential for "major" and "severe" impacts to the lower Cook Inlet is an unacceptable risk. The impacts described in the DEIS, along with the minimal economic impacts makes untenable any Alternative other than the No Action Alternative 2.

Respectfully submitted,

Kachemak Bay Conservation Society
Jim Stearns, President
Wendy Anderson, Secretary

PUBLIC SUBMISSION

As of: September 07, 2016
Received: September 06, 2016
Status: Posted
Posted: September 06, 2016
Tracking No. 1k0-8rr7-xf4k
Comments Due: September 06, 2016
Submission Type: Web

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0072
Comment from Dune Lankard, Center for Biological Diversity

Submitter Information

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2804 W. Northern Lights Blvd.
Anchorage, AK, 99517
Email: dlankard@biologicaldiversity.org
Phone: 907-952-5265
Organization: Center for Biological Diversity

General Comment

Please see attached for 305 comments from supporters with the Center for Biological Diversity. Many of these letters were personalized so we appreciate your close review.

Attachments

CookInletLeaseSale_CBD_305comments

Bureau of Ocean Energy Management
Attn: BOEM-2014-0001

Dear Abigail Hopper and Caron McKee,

I'm writing to urge you to cancel the proposed offshore lease sale in Cook Inlet. Allowing oil and gas companies to drill in our ocean for the next 40 years will deepen the climate crisis and threaten Alaska's people and wildlife with spills and air and water pollution.

The science is clear: To avoid the most catastrophic impacts of climate change, we must leave the majority of the world's fossil fuels in the ground. The proposed lease sale would do just the opposite, undermining President Obama's commitment to take robust action on climate change. And the fact that the proposed lease sale is sited off Alaska -- a place already encountering ill effects of climate change such as sea-level rise like coastal erosion, increased storm effects, sea-ice retreat and permafrost melt -- adds insult to injury.

New offshore drilling poses unacceptable risks to wildlife. Prince William Sound is still suffering the impacts of the catastrophic Exxon Valdez oil spill. Some of Alaska's most amazing animals, like Cook Inlet beluga whales, are struggling to survive in an increasingly industrialized habitat. The last thing they need is more offshore oil drilling.

For the good of Alaska's people, wildlife, climate and environment, I urge BOEM to cancel this lease sale and keep dirty fossil fuels where they belong: in the ground.

Thank you,

Cybele Knowles
3531 E. Fairmount St.
Tucson
Tucson, AZ 85716

Bureau of Ocean Energy Management
Attn: BOEM-2014-0001

Dear Abigail Hopper and Caron McKee,

As a citizen of Homer, Alaska, myself and my family WILL be directly impacted by this decision. My family (and everyone else I know locally) relies on the bounty of Cook Inlet for our subsistence and survival. Please make the right decision for our needs - I'm writing to urge you to cancel the proposed offshore lease sale in Cook Inlet. Allowing oil and gas companies to drill in our ocean for the next 40 years will deepen the climate crisis and threaten Alaska's people and wildlife with spills and air and water pollution.

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For the good of Alaska's people, wildlife, climate and environment, I urge BOEM to cancel this lease sale and keep dirty fossil fuels where they belong: in the ground.

Thank you,

Dylan Smith
4617 Sabrina Rd
Homer, AK 99603

Bureau of Ocean Energy Management
Attn: BOEM-2014-0001

Dear Abigail Hopper and Caron McKee,

Recent past oil and gas lease sales in Cook Inlet have not drawn interest. Why are you putting this area back on the auction block for such unsustainable, damaging activity in a waning industry? Please help us move to an energy industry based on sustainable, environmentally safe, renewable energy sources. Please support our nation's commitment towards taking actions that address climate change, not those that create more of it.

I'm writing to urge you to cancel the proposed offshore lease sale in Cook Inlet. Allowing oil and gas companies to drill in our ocean for the next 40 years will deepen the climate crisis and threaten Alaska's people and wildlife with spills and air and water pollution.

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For the good of Alaska's people, wildlife, climate and environment, I urge BOEM to cancel this lease sale and keep dirty fossil fuels where they belong: in the ground.

Thank you,

Laurie Daniel
PO Box 3713
Homer, AK 99603

Bureau of Ocean Energy Management
Attn: BOEM-2014-0001

Dear Abigail Hopper and Caron McKee,

I'm writing to urge you to cancel the proposed offshore lease sale in Cook Inlet. Allowing oil and gas companies to drill in our ocean for the next 40 years will deepen the climate crisis and threaten Alaska's people and wildlife with spills and air and water pollution.

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New offshore drilling poses unacceptable risks to wildlife. Prince William Sound is still suffering the impacts of the catastrophic Exxon Valdez oil spill. Some of Alaska's most amazing animals, like Cook Inlet beluga whales, are struggling to survive in an increasingly industrialized habitat. The last thing they need is more offshore oil drilling.

For the good of Alaska's people, wildlife, climate and environment, I urge BOEM to cancel this lease sale and keep dirty fossil fuels where they belong: in the ground. For the good of the planet, think ahead seven generations and plan responsibly, in good conscience, for all of life on earth. This reckless use of fossil fuels endangers all life here, and this is our only home--this earth.

Thank you,

jean hoegler
2400 Douglas Hwy., Unit 3
Juneau, AK 99801

Representative of Submittals from Center for Biological Diversity | Document too voluminous to include in FEIS | All documents reviewed and considered

Bureau of Ocean Energy Management
Attn: BOEM-2014-0001

Dear Abigail Hopper and Caron McKee,

I live next to Cook Inlet and I make my living guiding sport fisher persons who fish for salmon and halibut that depend on a healthy environment. The quality of the salmon and halibut currently found in Cook Inlet are second to none!! We would like that quality to remain high.

We are also concerned about the rapid decline in Beluga Whales in recent years. We used to see Belugas all the time. Now, we rarely see Beluga Whales. What is causing the decline? We suspect it is related to oil/gas exploration activities in Cook Inlet.

I'm writing to urge you to cancel the proposed offshore lease sale in Cook Inlet. Allowing oil and gas companies to drill in our ocean for the next 40 years will deepen the climate crisis and threaten Alaska's people and wildlife with spills and air and water pollution.

The science is clear: To avoid the most catastrophic impacts of climate change, we must leave the majority of the world's fossil fuels in the ground. The proposed lease sale would do just the opposite, undermining President Obama's commitment to take robust action on climate change. And the fact that the proposed lease sale is sited off Alaska adds insult to injury. This is a place already encountering the ill effects of climate change such as sea-level rise, coastal erosion, increased storm damages, sea-ice retreat and permafrost melt.

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For the good of Alaska's people, wildlife, climate and environment, I urge BOEM to cancel this lease sale and keep dirty fossil fuels where they belong: in the ground.

Thank you,

BOB Standish
PO BOX 1106
Kenai, AK 99611

907-283-7594

PUBLIC SUBMISSION

As of: September 07, 2016
Received: September 06, 2016
Status: Posted
Posted: September 06, 2016
Tracking No. 1k0-8rr8-vu4f
Comments Due: September 06, 2016
Submission Type: API

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0074
Comment from Daniel Hubbell, Environmental Investigation Agency

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General Comment

See attached file(s)

Attachments

EIA Cook Inlet DEIS comment_Final

September 6, 2016

Abigail Ross Hopper
Director
Bureau of Ocean Energy Management (BOEM)
381 Elden Street
Herndon, Virginia 20170

RE: Draft Environmental Impact Statement for the Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244; [Docket No. BOEM-2014-0001

Dear Director Hopper,

The Environmental Investigation Agency (EIA) appreciates the opportunity to comment on the Bureau of Ocean Energy Management's (BOEM) Draft Environmental Impact Statement for Outer Continental Shelf Oil and Gas Lease Sale 244 in Cook Inlet, Alaska ("Draft EIS"). We echo the disappointment of other groups in BOEM's decision to solicit public comment on the Draft EIS during an inconvenient season for many interested parties and for a comparatively short time and we provide the following comments on the Draft EIS.

Under the National Environmental Policy Act (NEPA) of 1969, all agencies are required to assess the environmental impacts of their proposed action, and "to identify and assess the reasonable alternatives to proposed actions that will avoid or minimize adverse effects of these actions upon the quality of the human environment".[1]

We agree with the comments originally submitted by the Marine Mammal Commission in response to BOEM's notice of intent to prepare this EIS, and believe that no leases should be offered in Cook Inlet until BOEM can "confirm that the lease sale [is] not likely to jeopardize the survival of the Cook Inlet beluga whale population".[2]

EIA believes that this Draft EIS has failed to confirm this information, and the most reasonable alternative identified by BOEM is to cancel the proposed lease sale. In particular, BOEM does not fully account for possible impacts of pollution and anthropogenic noise, both chronic and acute, on the beluga whales as a result of this lease.

Moreover, EIA shares the concern of other groups that the Draft EIS does not fully or accurately assess the impacts this proposed lease will have on climate change.

1. **The Draft EIS does not fully consider the impacts on the endangered Cook Inlet Beluga Whale population**

The threats posed by the proposed action in the Draft EIS are likely to have a serious impact on the Cook Inlet population of beluga whales. As correctly summarized in the Draft EIS, the Cook Inlet population has declined from an estimated 1,300 individuals in the 1970s to an estimated 340 in 2014.[3] While this decline was caused primarily by unsustainable subsistence hunting in the 1990s, the population has continued to decline at a rate of 0.4 percent rather than recover as expected.[4] In response to the ongoing decline NMFS designated the population as depleted in 2000 under the Marine Mammal Protection Act, and then Endangered under the Endangered Species Act in 2008.[5] In 2008 the National Marine Fisheries Service's (NMFS) projected a 26 percent probability of extinction in 100 years, and a 70 percent probability of extinction within 300 years.[6] In 2011, NFMS designated 3,016 square miles of Critical Habitat for the beluga whale, divided into two separate areas, and an exclusion zone.[7] A draft recovery plan was released for comment in 2015, but has not yet been finalized.[8] The Cook Inlet belugas are considered one of the eight most "at risk" populations, and was highlighted in 2016 by the Species in the Spotlight Program.[9]

One theory that could help explain this ongoing decline is presented by Wade et. al 2012. The authors compellingly demonstrate that odontocetes like the beluga are more dependent on social and behavioral factors for their development and survival.[10] As a result, they are less resilient to dramatic exploitation than mysticetes. This example reinforces the need for precaution in the management of the Cook Inlet belugas, especially in regard to social disruptors and stressors such as noise pollution, and to other threats that could pose a potentially cumulative impact such as chemical pollution.

A. The Draft EIS does not fully assess the threat of pollution

While the Draft EIS correctly notes that many known contaminant levels in the Cook Inlet population are lower than they are for other Alaskan populations, they are not universally below safe levels. For instance, levels of copper in the livers of Cook Inlet beluga whales (160 mg/kg) were above levels that cause kidney damage in bottlenose dolphins (29 mg/kg).[11] In their 2010 literature review, URS also found that some chemicals including polychlorinated biphenyls (PCB) were present at levels that might cause endocrine disruption, potentially impacting individual and population level reproductive health.[12]

Moreover, while the Draft EIS correctly notes that Cook Inlet beluga habitat has a lower level of polycyclic aromatic hydrocarbon (PAH) contamination than other urban areas, this fails to tell the whole story. In particular, in 2010 studies conducted on archived beluga tissue found significant concentrations of PAHs, especially in adult females and fetuses.[13] While these were below levels tested in the heavily urbanized St. Lawrence Estuary as the Draft EIS notes, they are well above those tested in Canada's Mackenzie Estuary.[14] Further study has also confirmed the possible bioaccumulation of PAHs by the Cook Inlet population, and PAH contamination in the population's current tissue levels has been identified as a data gap by researchers.[15] Yet in spite of this historic PAH level and its uncertain source, the Draft EIS not only dismisses contamination levels as a chronic threat, it suggests the historic impact of hydrocarbon extraction has been minimal.[16]

While the Draft EIS correctly identifies the strong "flushing effect" caused by Cook Inlet's tidal flow in removing many pollutants, the risk of chronic anthropogenic pollution as both a standalone and cumulative impact requires greater assessment. Especially in light of NMFS' decision to designate the partially overlapping beluga critical habitat partially on the basis of "Waters free of toxins or other agents of a type and amount harmful to CI beluga whales," the Draft EIS must more thoroughly assess the risk of contamination.[17]

B. BOEM does not fully analyze or mitigate the potential impacts of anthropogenic noise

The Draft EIS does not consider all of the possible impacts that noise may have on the beluga whale, nor does it consistently analyze or mitigate these impacts. Like all cetaceans, belugas depend heavily on sound to communicate, navigate, and hunt for prey. Beluga baseline hearing is also considered exceptional. In Castellote et al 2014, seven belugas caught from the wild population of Bristol Bay exhibited hearing ranges from 4-150 kHz.[18] Underwater sound from anthropogenic sources can have both negative direct and indirect impacts on individual belugas and entire populations. such as:

- Changes, either Temporary Threshold Shifts (TTS) or Permanent Threshold Shifts (PTS), to beluga hearing,
- masking the ability of animals to hear and decipher specific sounds,
- Altered vocal behaviors,
- displacement from important habitat and avoidance,
- possible strandings,
- increased stress,
- and possibly even physical injury or death.

, , [1920] As a result, noise impacts were identified both as their own high level threat impact to the Cook Inlet population's recovery, a further source of cumulative and synergistic impact, and a negative impact on prey species availability.[21] NMFS is currently proposing to study the levels of anthropogenic noise in Cook Inlet, and in the absence of further data a degree of precaution is necessary.[22]

Belugas are impacted by acute noise.

Belugas and closely related species have demonstrated a high sensitivity to certain kinds of acute noise. In two separate studies in the Canadian Arctic belugas exhibited a flight response from ice-breaking vessels at distances of up to 50 kilometers.[23] Other, less apparent impacts were either site avoidance or vocalization masking in response to piling conducted near the Port of Anchorage.[24] Of particular concern for the intended lease, the use of seismic airgun testing in Baffin Bay is hypothesized to have delayed the migration of several narwhal (*Monodon monoceros)* pods. As a result of the delayed migration, in three separate instances from 2008-2010 a total of approximately 1,200 narwhals were fatally entrapped by winter sea ice.[25] Other support from Traditional Ecological Knowledge (TEK) has noted belugas exhibit an avoidance response to the noise and vibrations from large on road vehicles in Cook Inlet.[26] A documented and noticeable decrease of vocalizations has also occurred in the St. Lawrence Estuary in the presence of shipping from ferries and motorboats.[2728]

BOEM's analysis of noise impacts is inconsistent and incomplete.

While the Draft EIS summarizes the impacts of acute noise on belugas, it incorrectly assumes that these impacts are "brief, minor effects", and applies two separate and conflicting standards to downplay the impact of the lease. [29] BOEM's first argues that "it is likely that marine mammals will avoid the area due to sound energy generated by the drilling activities" as a way of dismissing possible impacts from chemical pollution associated with drilling discharges, as well as other localized pollution.[30] While this displacement is supported by some of the studies discussed above, BOEM later cites contradicting evidence to argue that Cook Inlet's beluga whales have "at least partially habituated to" noise pollution.[31] This includes beluga whales spotted within 100-150 meters of artificial islands during drilling operations.[32] This creates a double standard, where belugas are either considered unaffected due to their flight response, or equally habituated to noise. BOEM has not adopted a logically consistent framework to considering noise's impact and the Draft EIS must be revised.

Both of BOEM's assumptions also disregard permanent impacts of noise. While BOEM briefly notes the possibility of temporary avoidance, which could result in "increased energy losses, possibly leading to reduced fitness," this is not elaborated on, and considered limited to the first few years of the project. However, there have been several instances of permanent habitat alteration have been reported in response to noise impacts, which are not referenced. Instead the Draft EIS states that the lease's activities are "not expected to result in "abandonment" of critical habitat".[33]Yet in 2009, the Environmental Protection Agency (EPA) found that noise from vessel traffic travelling to Red Dog Mine near Kotzebue had caused belugas to change their migratory route away from the area, negatively impacting the local subsistence hunters.[34] In another example provided by TEK, hunters cited increasing motorboat traffic for displacing the beluga population from its traditional habitat in Cumberland Sound, Canada.[35] In light of the increased vessel traffic and related activities envisioned in the Draft EIS, BOEM should reanalyze the possible threat of permanent habitat abandonment.

Cumulative noise and stress are not fully accounted for.

The Draft EIS' other suggestion that belugas have "at least partially habituated to" anthropogenic noise does not accurately reflect the possible negative impacts of cumulative noise. While BOEM dismisses the project's noise impact as a relatively minor increase to the overall soundscape, increasing chronic noise is what the 2015 Cook Inlet Beluga Recovery Plan termed a "death by a thousand cuts".[36] By considering its own impacts- namely through seismic testing, vessel traffic (namely propeller cavitation), and drilling and equipment noise[37]- in a vacuum, BOEM neglects to account for the impact its further contribution to an

already noisy environment. Most recently on July 20th, 2016, NMFS issued an Incidental Harassment Authorization (IHA) to Apache Alaska Corporation to harass an estimated 30 beluga whales annually from 2015-2020.[38] Additionally three other companies, Hilcorp, Furie, and SAExploration have either announced their intentions to conduct further seismic testing or have already conducted testing this year.[39] This is to say nothing of increasing vessel traffic, construction, municipal traffic, and other sources of anthropogenic noise that this proposed lease would add to. The Draft EIS must account for the possible cumulative and synergistic impact the additional noise could potentially create.

Noise could have a cumulative impact on the level of stress experienced by the Cook Inlet population. Stress levels in cetaceans are not fully understood, but some studies have found that noise from anthropogenic sources like ships can be a contributing factor.[40] In fact, cumulative noise has been identified as a concern by the National Oceanic and Atmospheric Association (NOAA) in its agency wide draft 2016 *Ocean Noise Strategy Roadmap*.[41] However, neither these studies nor the Roadmap are discussed by the Draft EIS, and a fuller discussion of long-term noise on beluga stress levels is warranted.

BOEM's proposed alternatives are insufficient and inconsistent.

BOEM's proposed alternative to mitigate impacts fails to meet the necessary standards identified in its review. Based on input from NMFS, BOEM's proposed alternative 3C would impose a 10-mile restricted area to the anadromous streams utilized by belugas as a feeding area, which could be waived if the lessee meets a vaguely described standard of "commensurate protection".[42] While the idea correctly builds on NMFS' own modeling and mitigation around the important feeding and breeding area in the Susitna Delta, it falls short of the 12.4-mile avoidance response to seismic airguns reviewed by BOEM in the Draft Environmental Impact Statement.[43] At a minimum this should be expanded to account for the full distance.

BOEM's reasoning for keeping the ten blocks that overlap with designated beluga Critical Habitat, an estimated 2.68 percent of the total lease, is also inconsistent with ESA protection.[44] As noted by in the Commission's 2014 letter, these areas are not just historic places of use, as recent observer's reports in 2012 and 2013 have spotted beluga whales in close proximity to the leasing site.[45] While BOEM proposes removing these areas from the lease as part of Alternative 3A, it is unclear to EIA why this area has remained in the lease at all, especially in light of the exclusion of northern sea otter critical habitat and no clear justification is provided for keeping this area in the lease.[46]

Conclusion

With an estimated 340 belugas remaining in Cook Inlet, a precautionary approach is vital to ensure the survival of the species. EIA does not believe the proposed lease is consistent with this policy, and the Draft EIS itself must also more thoroughly reassess the impacts of pollution and anthropogenic noise pollution, both acute and cumulative, on the population. EIA recommends that BOEM cancel the propose lease, and defer others until the Cook Inlet beluga population demonstrates sufficient recovery.

Thank you for your consideration,

Daniel Hubbell
Policy Analyst
Environmental Investigation Agency

[1] 40 C.F.R. ss 1500.2(e)
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[4] Ibid.
[5] Ibid.
[6] National Marine Fisheries Service. (2015). Draft Recovery Plan for the Cook Inlet Beluga Whale (Delphinapterus leucas). National Marine Fisheries Service, Alaska Regional Office, Protected Resources Division, Juneau, AK. Available at: https://alaskafisheries.noaa.gov/sites/default/files/draft-cibrecoveryplan051515.pdf
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[8] Ibid.
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[11] Norman 2011
[12] URS Corp., 2010. Chemical exposures for Cook Inlet beluga whales: a literature review and evaluation. Report prepared for NOAA Fisheries, National Marine Fisheries Service, Anchorage, Alaska. Available at: https://alaskafisheries.noaa.gov/protectedresources/whales/beluga/reports/cibtoxicology0310.pdf
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[14] Ibid.
[15] Norman, S. A., Hobbs, R. C., Goertz, C. E., Burek-Huntington, K. A., Shelden, K. E. W., Smith, W. A., & Beckett, L. A. (2015). Potential natural and anthropogenic impediments to the conservation and recovery of Cook Inlet beluga whales, Delphinapterus leucas. *Mar. Fish. Rev*, *77*(2), 89-105.
[16] Bureau of Ocean Energy Management (2016). Cook Inlet Planning Area: Draft Environmental Impact Statement. OCS EIS/EIA BOEM 2016-004. Available at: http://www.boem.gov/ak244/
[17] NMFS 2015
[18] Castellote, M., Mooney, T.A., Quakenbush, L., Hobbs, R., Goertz, C., Gaglione, E. (2014). Baseline hearing abilities and variability in wild beluga whales (*Delphinapterus leucas). The Journal of Experimental Biology 217.* Available at: http://jeb.biologists.org/content/217/10/1682.full
[19] Miller, A. (2015). An analysis of underwater noise regulation: beluga whale protection in Cook Inlet in Anchorage: Alaska. School of Community and Regional Planning: University of British Columbia.
[20] NMFS 2015
[21] Ibid
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[23] Culik, B. (2010) Odontocetes. The toothed whales: "Delphinapterus leucas". UNEP/CMS Secretariat, Available at: http://www.cms.int/small-cetaceans
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[26] Carter, B.T.G., Nielsen, E.A. (2011). Exploring ecological changes in Cook Inlet beluga whale habitat through traditional and local ecological knowledge of contributing factors for population decline. *Marine Policy 35.*
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[29] BOEM 2016
[30] Ibid.
[31] Ibid.
[32] Ibid.
[33] Ibid.
[34] EPA, (2009). Red Dog Mine Extension: Aqqaluk Project. Available at: http://dnr.alaska.gov/mlw/mining/largemine/reddog/pdf/rdseis2009vol1.pdf

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[36] NMFS 2015
[37] BOEM 2016
[38] 81 FR, 47420 (2016).
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[42] BOEM 2016
[43] Ibid.
[44] Ibid.
[45] Lent 2014
[46] Ibid.

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Representative of Submittals from Peter Heisler | Document too voluminous to incluse in FEIS | All documents reviewed and considered

PUBLIC SUBMISSION

As of: September 07, 2016
Received: September 06, 2016
Status: Posted
Posted: September 06, 2016
Tracking No. 1k0-8rrb-tyok
Comments Due: September 06, 2016
Submission Type: Web

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0082
Comment from Peter Heisler, ACAT, Cook Inletkeeper, Earthjustice, EIA, Katchemak Bay Conservation Society, Sierra Club Alaska Chapter

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General Comment

Please see the attached comments, including attachments, submitted by Alaska Community Action on Toxics, Cook Inletkeeper, Earthjustice, Environmental Investigation Agency, Katchemak Bay Conservation Society, and Sierra Club Alaska Chapter on the Cook Inlet OCS Lease Sale 244 DEIS.

Attachments

_ACAT et al. Lease Sale 244 Comments (9-6-2016)

Aerst & Streever, Modeled and Measured (2016)

BOEM, Consumer Surplus, Market Simulation Model 2012

BOEM, Consumer Surplus, Market Simulation Model 2015

Blanco, Drivers, Trends and Mitigation (2014)

Representative of Submittals from Peter Heisler | Document too voluminous to incluse in FEIS | All documents reviewed and considered

CEQ, EJ Guidance ((1997)

CEQ, Final Guidance on NEPA and Climate Change (Aug 2016)

Blackwell et al., Effects of Airgun Sounds (2015)

Clark et al., Acoustic masking (2009)

DF Dickins Associates Ltd, Oil Spill Projects

Carbon Tracker, Lost in Translation

Ellison et al., Modeling aggregated exposure (2016)

Ellison et al., Context-Based Approach (2011)

Erickson, U.S. again overlooks top CO2 impact

Erickson, Carbon lock-in from fossil fuel supply infrastructure (2015)

Hildebrand, Impacts of Anthropogenic Sound

Huntington, Traditional knowledge of the ecology of belugas

Erickson & Lazarus, How would phasing out US federal leases (2016)

Guerra et al., Quantifying seismic survey reverberation

Interagency Working Group on Social Cost of Carbon, Technical Support Document (2015)

ITOPF, Limitations of Containment & Recovery (2011)

Lent, MMC Comments (2014)

Lubcheco letter to Birnbaum, NOAA 2009 Comments (9-21-2009)

Lubchenco, et al., BP Deepwater Horizon Oil Budget (2010)

IPCC, Climate Change 2014

IEA, World Energy Outlook (2012) (excerpt)

MMS, Mechanical Containment, 4-21-10

MMS, Multi-Sale FEIS (2003) (excerpts)

Nikiforuk, Why We Pretend to Clean Up Oil Spills _ Science _ Smithsonian

NMFS, Conservation Plan for the beluga whale (2008)

NMFS, Draft Recovery Plan (2015)

Nowacek et al., Comments on Atlantic seismic IHA

NRC, Ocean Noise and Marine Mammals (2003)

NMFS, Right whale recovery plan (2013)

Representative of Submittals from Peter Heisler | Document too voluminous to incluse in FEIS | All documents reviewed and considered

Nuka, Oil Spill Response Mechanical Recovery Systems (2007)

Nuka, Oil Spill Prevention and Response in the US Arctic Ocean

Nellemann et al., In Dead Water (2008)

Rolland et al., Evidence that ship noise increases stress (2012)

Richardson et al. 1995 (excerpt)

Shelden et al. (2014)

U.S. Naval, NW FEIS (Excerpt) (reduced)

UN, Copenhagen Agreement (Dec 2009)

UN, Paris Agreement (Dec. 12, 2015)

US, Intended Nationally Determined Contribution (2015)

Olhoff, Emissions Gap Report 2015

Votier et al., Oil Pollution and Climate

USDOI MMS, Arctic Research, Decade of Achievement

SL Ross, Beaufort Sea Oil Spills State of Knowledge (2010)

Wolfe et al. Fate of Oil Exxon Valdez

Whale and Dolphin COnserv Soc'y, Ocean of Noise (2004)

EIA, Assumptions to 2015 Energy Outlook

ALASKA COMMUNITY ACTION ON TOXICS—COOK INLETKEEPER
DEFENDERS OF WILDLIFE—EARTHJUSTICE
ENVIRONMENTAL INVESTIGATION AGENCY
EYAK PRESERVATION COUNCIL
KATCHEMAK BAY CONSERVATION SOCIETY
NATURAL RESOURCES DEFENSE COUNCIL—SIERRA CLUB ALASKA CHAPTER

September 6, 2016

VIA REGULATIONS.GOV

Abigail Ross Hopper, Director
Bureau of Ocean Energy Management
45600 Woodland Road
Sterling, VA 20166

Re: Draft Environmental Impact Statement for the Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244 (81 Fed. Reg. 47,819 (July 22, 2016))

Dear Director Hopper:

Thank you for the opportunity to comment on the Draft Environmental Impact Statement (Draft EIS) for the Cook Inlet Outer Continental Shelf (OCS) Oil and Gas Lease Sale 244 in which the Bureau of Ocean Energy Management (BOEM) proposes "to offer for lease certain OCS blocks located within the federally-owned portion of Cook Inlet that may contain economically recoverable oil and gas resources."[1] We regret that BOEM has chosen to hold the comment period for the Draft EIS during the height of the summer fishing and subsistence season and has refused to make accommodations for the burden this places on the Alaskan public. BOEM's lack of consideration for the most affected communities has made commenting difficult. Nonetheless, the undersigned groups, which represent thousands of Alaskans, among others, provide the following comments.

As discussed below, BOEM has unreasonably limited the scope of the present action to oil and gas development. Furthermore, the Draft EIS fails to address climate change and other important environmental impacts as required by the National Environmental Policy Act (NEPA). Before BOEM makes a decision about whether, when, and where to offer leases, it must consider alternative uses of the OCS and fully assess and disclose the potential consequences of the proposed action. Of paramount importance, BOEM must consider how developing oil and gas from Cook Inlet comports with the United States' commitments to reduce greenhouse gas emissions and combat climate change. The undersigned groups believe that a full assessment of the effects and alternatives will lead to the conclusion that BOEM should cancel the proposed lease sale.

[1] BOEM, Cook Inlet Planning Area Oil and Gas Lease Sale 244 Draft Environmental Impact Statement, OCS EIS/EA BOEM 2016-004 at 1-3 (June 2016) (Draft EIS).

I. BOEM'S PURPOSE AND NEED STATEMENT IS IMPERMISSIBLY NARROW

An environmental impact statement (EIS) prepared under NEPA must "briefly specify the underlying purpose and need to which the agency is responding in proposing the alternatives including the proposed action."[2] This statement guides the agency's development of alternatives, and it therefore cannot be "so unreasonably narrow that only one alternative from among the environmentally benign ones in the agency's power would accomplish the goals of the agency's action."[3] When assessing the reasonableness of the purpose and need statement, courts consider the statutory context of the proposed action.[4] The Draft EIS unreasonably defines the purpose and need of this action so as only to consider development of oil and gas in Cook Inlet.

BOEM appropriately identifies a need of "further[ing] the orderly development of OCS resources in accordance with the Outer Continental Shelf Lands Act (OCSLA)," but it narrowly defines the purpose of the proposed action as "offer[ing] for lease certain OCS blocks located within the federally-owned portion of Cook Inlet *that may contain economically recoverable oil and gas resources*."[5] By framing the action in this way, BOEM precludes alternatives that would offer the Cook Inlet OCS for renewable energy projects.[6]

OCSLA requires BOEM to manage the OCS considering "economic, social, and environmental values of the *renewable* and nonrenewable resources contained in the [OCS]."[7] It further authorizes the agency to issue leases promoting the production of energy from sources other than oil and gas, including renewables.[8] BOEM notes that, "[w]ith their large dynamic range, the tides in Cook Inlet could be an important renewable power source for the region."[9] In light of its statutory authority to lease the OCS for development other than oil and gas extraction, and the great renewable energy potential of Cook Inlet, it is unreasonable for BOEM to define the purpose and need of the proposed action in a way that prevents consideration of this use of the OCS. BOEM must not only revise and broaden its purpose and need statement, but also consider new alternative that would satisfy that purpose and need, such as those involving developing renewable energy in the Cook Inlet OCS.

[2] 40 C.F.R. § 1502.13.
[3] *League of Wilderness Defs.-Blue Mountains Biodiversity Project v. U.S. Forest Serv.*, 689 F.3d 1060, 1069 (9th Cir. 2012) (internal quotation marks and citation omitted).
[4] *Id.* at 1070.
[5] Draft EIS at 1-3 (emphasis added).
[6] *See id.* at 2-14 to 2-16 (discussing alternatives considered but not analyzed in detail, which do not include renewable energy).
[7] 43 U.S.C. § 1344(a)(1) (emphasis added).
[8] *Id.* § 1337(p)(1)(C).
[9] Draft EIS at 5-17.

II. BOEM'S ANALYSIS OF THE NO-ACTION ALTERNATIVE IS FLAWED AND OBSCURES POTENTIAL CLIMATE BENEFITS

Every EIS must contain a no-action alternative as a baseline against which to measure the effects of the action alternatives.[10] "A no action alternative in an EIS allows policymakers and the public to compare the environmental consequences of the status quo to the consequences of the proposed action."[11] When an agency premises its conclusions about the no-action alternative on mistaken legal or factual assumptions, a court may hold the agency's EIS invalid.[12] BOEM's discussion of the no-action alternative relies on a shortsighted, outdated, and overly general analysis; moreover, it disregards the effects of lowering the supply of fossil fuels on global consumption, especially as countries take steps to respond to the climate crisis. It therefore violates NEPA.

A. The Draft EIS relies on a flawed analysis to assess the environmental consequences of the no-action alternative.

BOEM's model for estimating substitute energy sources under the no-action alternative wrongly assumes that the nation will continue to conduct business as usual for the next several decades. BOEM thus predicts that much of the oil and gas forgone from offshore sources under the no-action alternative will be replaced with oil imported from overseas and domestic onshore oil and gas.[13] This substitute energy would cause air emissions and other pollution from transportation, impacts from potential spills, and degradation of water quality and habitat.[14] Although the Draft EIS does not analyze these effects in detail, it notes that energy substitutions "would have their own environmental and socioeconomic impacts that could displace impacts from the Proposed Action to other geographic areas and resources."[15] However, as discussed in greater detail below, the United States has committed to reducing its greenhouse gas emissions to meet the challenge of climate change. In a more realistic policy scenario, then, if the proposed lease sale does not take place, there likely would be fewer substitute fossil fuels developed to replace forgone oil and gas, and the no-action alternative would have lesser environmental impacts than the Draft EIS suggests.

Even setting aside the unreasonable business-as-usual assumption, BOEM's modeling is nonetheless outdated and imprecise. The Draft EIS concludes that the no-action alternative would lead to an increase of oil imports in the range of 85.5 to 122.6 million barrels.[16] BOEM arrives at this result by multiplying total expected oil production under the exploration and

[10] 40 C.F.R. § 1502.14(d); *Ctr. for Biological Diversity v. U.S. Dep't of the Interior*, 623 F.3d 633, 642 (9th Cir. 2010).
[11] *Ctr. for Biological Diversity*, 623 F.3d at 642.
[12] *See id.*
[13] BOEM, OCS Oil and Gas Leasing Program: 2017-2022 Draft Programmatic EIS at 4-130 to 4-131 & Tbl. 4.4.3-1 (Mar. 2016) (2017-2022 DPEIS); *see also* Draft EIS at 4-231.
[14] *See* Draft EIS at 4-231.
[15] *Id.*
[16] *Id.*

development scenario[17] by 57 percent, the average proportion of forgone oil that oil imports would supposedly replace.[18] That percentage, however, derives from the agency's 2012 projection of supply and demand using a model and inputs that have since been updated.[19] The more recent analysis lists a lower replacement percentage from oil and gas imports.[20] BOEM should apply the most current predictions of energy substitutes when analyzing the no-action alternative.

More broadly, the replacement percentage represents the energy that oil imports would provide under an alternative in which *no* areas of the OCS are leased,[21] which may be more or less than the percentage of imports that would replace forgone oil from the proposed action. BOEM asserts that, because oil and gas produced from Cook Inlet would be consumed locally, "the most logical replacement for lost or delayed oil and gas due to selection of the No Action Alternative would be additional imports or additional domestic production."[22] It also notes that, while reduced demand would likely replace some of the forgone oil and gas, renewable energy sources "would not likely contribute enough replacement energy for lost or delayed oil and gas production from Cook Inlet."[23] Without a more specific prediction of likely substitute energy sources for forgone oil and gas from the lease sale under the no-action alternative, however, it is impossible for the public and BOEM to assess the no-action alternative's effects.

B. The Draft EIS obscures the potential climate benefits of the no-action alternative.

The Draft EIS's discussion of the no-action alternative omits any mention of potential climate benefits, instead asserting that, "[t]o replace the potential production of [oil and gas] that BOEM estimates could be produced from the Proposed Action, equivalent volumes would need to be produced from other sources, including domestic or imported oil and gas."[24] Although the

[17] *Id.* at 2-21, Tbl. 2.4.3-2 (total oil production of 150 to 215 million barrels).
[18] *Id.* at 4-231.
[19] *See id.*; BOEM, 2012-2017 OCS Oil and Gas Leasing Program Final Programmatic EIS at 4-643 to 4-644 & Tbl. 4.5.7-7 (July 2012) (2012-2017 PEIS). *Compare* BOEM, Consumer Surplus and Energy Substitutes for OCS Oil and Gas Production: The 2015 Revised Market Simulation Model (MarketSim), OCS Study BOEM 2015-054 (Dec. 2015) (MarketSim 2015), *with* BOEM, Consumer Surplus and Energy Substitutes for OCS Oil and Gas Production: The 2015 Revised Market Simulation Model (MarketSim), OCS Study BOEM 2012-024 (2012) (MarketSim 2012). Incidentally, the table in the 2012-2017 PEIS indicates that oil imports would replace 56 to 62 percent of forgone OCS production—not the 52 to 62 percent that the draft EIS states. Cited materials are submitted herewith and should become part of the administrative record.
[20] *Compare* 2012-17 PEIS at 4-644, Tbl. 4.5.7-7 (listing energy substitutions of 64 to 71 percent from oil and gas imports), *with* 2017-2022 DPEIS at 4-131, Tbl. 4.4.3-1) (listing energy substitutions of 58 percent from oil and gas imports).
[21] *See* 2012-2017 PEIS at 4-643 to 4-644 & Tbl. 4.5.7-7.
[22] Draft EIS at 4-231.
[23] *Id.*
[24] *Id.* at 4-230.

document goes on to discuss a variety of energy sources that might replace oil and gas from Cook Inlet, as predicted by the 2012 market model, both that model and the current version elide the true effects of decreasing the supply of oil and gas from the OCS on *global* consumption. This is so for two reasons. First, the model ignores the global nature of the oil and gas market, which in fact responds to decreases in supply. Second, it does not take into account the United States' and other countries' commitments to reduce their greenhouse gas emissions in light of compelling climate science, which will likely require them to develop and consume smaller amounts of fossil fuels. These reductions in fossil fuel production and consumption will amplify the positive effects of keeping Cook Inlet oil and gas in the ground.

1. The global nature of the oil market

A recent report by the Stockholm Environment Institute demonstrates that reducing the supply of oil from federal lands could affect global oil markets and lead to a reduction in oil consumption.[25] The report analyzes the impact of reforming the leasing of federal coal, oil, and gas—including in the OCS—on international energy markets and global CO_2 emissions.[26] It finds that, for each unit of oil that is not produced from federal lands, net global consumption of substitute fuels falls by 0.22 units by 2030 (due to a decrease in global supply) with a proportionate decrease in greenhouse gas emissions.[27] Thus, not holding a lease sale in Cook Inlet would reduce global greenhouse gas emissions and mitigate climate change, an outcome that the Draft EIS entirely fails to acknowledge. BOEM must analyze this effect of the lease sale.

Indeed, BOEM appears to recognize that forgoing production of oil and gas would decrease domestic consumption.[28] As discussed above, it also predicts that some of the forgone oil would be replaced by increases in imported oil, but it fails to acknowledge that importing oil would reduce consumption abroad.[29] As another recent analysis from the Stockholm Environment Institute demonstrates, excluding the international market effects dramatically

[25] P. Erickson & M. Lazarus, *How Would Phasing Out U.S. Federal Leases for Fossil Fuel Extraction Affect CO_2 Emissions and 2°C Goals?*, Stockholm Environment Institute, Working Paper 2016-02 at 31-32 (2016) (Erickson & Lazarus).
[26] *Id.* at 3-5.
[27] *Id.* at 23-25. The report models a cut in oil production as a shift in the supply curve and uses published estimates of the price elasticities for supply and demand to calculate changes in net consumption. The report concludes that for each unit of forgone production, net global oil consumption will drop by 0.44 units, meaning that substitution from other oil supplies would make up only 0.56 units of the lost production. Additionally, half of the remaining 0.4 unit decrease in net consumption would be made up by increased consumption of other oil substitutes, such as biofuels, natural gas and electricity, giving a total drop of consumption of 0.22 units. *Id.* at 24 & Tbl. 5.
[28] *See* Draft EIS at 4-231.
[29] *See id.* at 4-231 to 4-232; 2017-2022 DPEIS at 4-131. This seems inconsistent with BOEM's 2015 model, which correctly treats the oil market as global. MarketSim 2015 at 26; *see also id.* at 5 ("MarketSim models oil as a global market.").

understates how OCS leasing will affect consumption and therefore greenhouse gas emissions.[30] By not introducing OCS oil into the market, the United States would import more oil from abroad, which would reduce supply abroad, with corresponding reduced greenhouse gas emissions. The Stockholm Environment Institute analysis indicates that the no-action alternative would reduce global consumption of fossil fuels and greenhouse gas emissions, and the Draft EIS must discuss these advantages.

2. The climate context

The no-action alternative also violates NEPA because it fails to recognize the climate context in which this decision is being made and how climate commitments will amplify the no-action alternative's reductions in consumption and greenhouse gas emissions. The international scientific community has reached a consensus that in order to preserve a fair chance to avoid the worst effects of climate change, the world must cap its emissions of greenhouse gases and that burning even a fraction of the remaining fossil-fuel reserves would cause us to exceed that cap. Indeed, the vast majority of known fossil-fuel reserves, let alone undiscovered future resources, must remain undeveloped to provide a chance of meeting climate goals. Accordingly, choices must be made about which resources to extract and burn and which to leave undeveloped. Fossil-fuel extraction decisions must be assessed in the context of this framework.

The concept of a carbon budget starts from the well-established scientific understanding that the global increase in temperature due to greenhouse gas emissions must be capped at or below 2 °C above pre-industrial levels to avoid unmanageable climate change consequences. This understanding was enshrined in the Copenhagen Accord[31] in 2009 and was recently reaffirmed and strengthened in the Paris Agreement,[32] which established a commitment to take efforts to limit temperature rise to 1.5 °C above pre-industrial levels.

In the fall of 2014, the Intergovernmental Panel on Climate Change (Panel) published a comprehensive synthesis of the latest worldwide scientific consensus on climate change, called the Climate Change 2014 Synthesis Report.[33] The synthesis describes the recent scientific consensus that there is an overall limit to the amount of carbon dioxide (CO_2) that can be released into the atmosphere to stay within the 2 °C warming cap.[34] It calculates that emissions

[30] P. Erickson, *U.S. again overlooks top CO2 impact of expanding oil supply . . . but that might change* (Apr. 30, 2016), https://www.sei-international.org/blog-articles/3388.
[31] Copenhagen Accord ¶ 1, *agreed* Dec. 18, 2009, FCCC/CP/2009/11/Add.1, http://unfccc.int/resource/docs/2009/cop15/eng/11a01.pdf ("recognizing the scientific view that the increase in global temperature should be below 2 degrees Celsius" relative to pre-industrial temperatures to "stabilize greenhouse gas concentration in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system"); *id.* at ¶ 2 (agreeing that "deep cuts in global emissions are required according to science" to meet this goal).
[32] Paris Agreement art. 2, ¶ 1(a), *adopted* Dec. 12, 2015, FCCC/CP/2015/L.9/Rev.1, http://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf (Paris Agreement).
[33] Intergovernmental Panel on Climate Change, Climate Change 2014: Synthesis Report (2014), http://www.ipcc.ch/report/ar5/syr/ (IPCC Synthesis Report).
[34] *Id.* at 63.

would need to be limited to about 2,900 gigatons of CO_2 ($GtCO_2$) since 1870 to have a reasonable chance of staying within the cap.[35] By 2011, about 1,900 $GtCO_2$ had already been emitted.[36] Thus, the report concludes, to provide better than a 66 percent chance of limiting warming to less than 2 °C, additional carbon dioxide emissions must be limited to 1,000 $GtCO_2$.[37]

The report estimates that there are about 3,670-7,100 $GtCO_2$ in proven fossil-fuel "reserves" remaining in the ground,[38] which it describes as quantities of fossil fuels "able to be recovered under existing economic and operating conditions."[39] As the report notes, this volume of reserves is four to seven times the amount that can be burned to have better than a 66 percent chance of remaining within the 2 °C warming goal, with the amount of somewhat less certain "resources" much larger still.[40] One of the expert reports feeding into the Panel's synthesis explained that to meet "[t]he emissions budget for stabilizing climate change at 2 °C above pre-industrial levels . . . only a small fraction of reserves can be exploited."[41]

Subsequently, researchers have investigated and further refined our understanding of how major investment in developing such resources locks in oil production far into the future. In particular, a research brief from the Stockholm Environment Institute identified oil drilling, especially in higher-cost, yet-to-produce resources, as particularly prone to locking in future fossil fuel production. The high up-front sunk costs required prior to any return on investment create momentum for future over-production, adding fossil fuels to markets that should, consistent with limiting climate damage, be shrinking, thereby depressing adoption of efficiency measures and clean alternatives.[42]

The United States is playing a leading role in catalyzing world commitments to address the urgent crisis of climate change. It recently signed the Paris Agreement, which committed the United States and most of the world's countries to steadily and verifiably reducing their carbon emissions to hold the increase in global temperature average to "well below 2 °C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 °C above pre-

[35] *Id.* ("[L]imiting total human-induced warming . . . to less than 2°C relative to the period 1861–1880 with a probability of >66% would require total CO_2 emissions from all anthropogenic sources since 1870 to be limited to about 2900 $GtCO_2$").
[36] *Id.*
[37] *Id.*
[38] *Id.* at 64, Tbl. 2.2.
[39] *Id.* Tbl. 2.2 n.f (defining "reserves" and noting that "resources," by contrast, are quantities of fossil fuels where economic extraction is potentially feasible).
[40] *Id.* at 63.
[41] G. Blanco *et al.*, *Drivers, Trends and Mitigation*, *in* Climate Change 2014: Mitigation of Climate Change, Working Group III Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change at 251, 380 (2014), http://www.ipcc.ch/pdf/assessment-report/ar5/wg3/ipcc_wg3_ar5_chapter5.pdf.
[42] Erickson, P. *et al.*, *Carbon Lock-in from Fossil Fuel Supply Infrastructure*, Stockholm Environment Institute at PDF 1 (2015), http://www.sei-international.org/publications?pid=2805.

industrial levels."[43] Reaching the Paris Agreement goals will require the United States to adopt measures that urgently reduce reliance on fossil fuels,[44] including a shift away from further fossil fuel development. Limiting the supply of fossil fuels must be a part of any comprehensive plan to address climate change. The international scientific community has reached a consensus that burning even a fraction of the world's remaining known fossil-fuel reserves, let alone undiscovered future resources like those at issue in the proposed program, would cause us to exceed climate goals.[45]

As described above, in its analysis of the relative contributions of substitute energy sources, BOEM assumes that the nation will conduct business as usual for the next 40 years.[46] The business-as-usual prediction is a far outlier of potential energy consumption scenarios—predicting more oil demand than even OPEC and the largest multi-national oil and gas companies.[47] It is also not reasonable to assume that laws in place three years prior to the date of the proposed lease sale will govern through the next four decades. Rather, in a rational climate future in which demand for oil and gas does not follow a business-as-usual trajectory—for example if the nation follows through on its climate commitments and implements needed

[43] Paris Agreement art. 2, ¶ 1(a).
[44] In the Paris Agreement, nations agreed to aim to "achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century." Paris Agreement art. 4, ¶ 1. Experts have calculated that for CO_2, net emissions must reach zero between 2045 and 2050 to have a greater than 50% chance of limiting warming to 1.5 °C and between 2060 and 2075 to stay within 2 °C warming. Olhoff, A. *et al.*, The Emissions Gap Report 2015: A UNEP Synthesis Report at 5-6 & Tbl. 2.1 (2015), http://uneplive.unep.org/media/docs/theme/13/EGR_2015_Technical_Report_final_version.pdf. In its individual commitments, the United States identifies economy-wide emission reductions of 80% or more by 2050, noting that this "target is part of a longer range, collective effort to transition to a low-carbon global economy as rapidly as possible." U.S. Department of State, United States Intended Nationally Determined Contribution at PDF 2 (2015), http://www4.unfccc.int/submissions/INDC/Published%20Documents/United%20States%20of%20America/1/U.S.%20Cover%20Note%20INDC%20and%20Accompanying%20Information.pdf.
[45] *See* International Energy Agency, World Energy Outlook 2012 at 25 (2012), https://www.iea.org/publications/freepublications/publication/WEO2012_free.pdf; IPCC Synthesis Report at 63.
[46] *See* 2017-2022 DPEIS at 4-130, Fig. 4.4.3-2 (graphing the effects of energy substitutes over 40 years); MarketSim 2015 at 2 ("The baseline supply and demand projections in MarketSim were obtained from a customized model run of EIA's NEMS model."); U.S. Energy Information Administration, Assumptions to the Annual Energy Outlook 2015 at 2 (2015) ("The potential effects of proposed federal and state legislation, regulations, or standards . . . are not reflected in NEMS.").
[47] *See* Carbon Tracker Initiative, Lost in Transition: How the Energy Sector Is Missing Potential Demand Destruction at 92, Fig. 8.113 (Oct. 2015), http://www.carbontracker.org/wp-content/uploads/2015/10/Lost-in-transition_Clean_Draft.pdf (showing EIA business-as-usual scenario forecasts highest oil consumption of all scenarios); *see also id.* at 31 (noting that EIA's forecast is business-as-usual).

measures to sharply limit the amount of greenhouse gases that can be emitted into the atmosphere—there very likely will be less need for oil and gas.

Because it overlooks this probable scenario, the Draft EIS does not capture the potential climate benefits of the no-action alternative. As noted, a Stockholm Environment Institute report demonstrates that reducing the supply of oil from federal lands can affect global oil markets and reduce oil consumption and greenhouse-gas emissions.[48] The report further concludes that limiting supply in low-carbon scenarios, in which countries adopt normative limits on carbon supply and use, will have a larger effect on consumption and emissions than in a high-carbon scenario.[49] Thus, assuming the United States and other countries follow through on their climate commitments, the no-action alternative will lead to significant reductions in the consumption of oil and gas (and thus in emissions of greenhouse gases), beyond those of simply decreasing supply. The Draft EIS should disclose these foreseeable climate benefits.

III. BOEM MUST FULLY ASSESS THE PROPOSED ACTION'S CLIMATE EFFECTS

NEPA requires agencies to discuss cumulative impacts, *i.e.*, "the incremental impact[s] of the action when added to other past, present, and reasonably foreseeable future actions."[50] "Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."[51] Climate impacts fit this description well because they are caused by the incremental additions of greenhouse gases to the atmosphere from numerous sources.[52] An EIS must therefore assess the proposed action's greenhouse gas emissions and discuss their cumulative impacts on the climate in its analysis of the action's effects.[53]

In addition to estimating a proposed action's direct contributions to climate change, agencies must analyze its indirect effects.[54] According to guidance from the Council on Environmental Quality (CEQ), these effects include emissions from "[a]ctivities that have a reasonably close causal relationship to the [proposed] action, such as those that may occur as . . . a consequence of the agency action."[55] "NEPA reviews for proposed resource extraction and

[48] Erickson & Lazarus at 31-32.
[49] *Id.* at 37.
[50] 40 C.F.R. § 1508.7.
[51] *Id.*
[52] *See Ctr. for Biological Diversity v. NHTSA*, 538 F.3d 1172, 1217 (9th Cir. 2008) ("The impact of greenhouse gas emissions on climate change is precisely the kind of cumulative impacts analysis that NEPA requires agencies to conduct."); *see also* Council on Environmental Quality, Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews at 17 (2016) (CEQ Guidance) ("[T]he analysis of the effects of GHG emissions is essentially a cumulative effects analysis[.]"); *cf. Massachusetts v. EPA*, 549 U.S. 497, 524 (2007).
[53] *Ctr. for Biological Diversity*, 538 F.3d at 1217; CEQ Guidance at 17.
[54] *See* 40 C.F.R. § 1508.8(b) (defining indirect effects as those that are "caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable").
[55] CEQ Guidance at 13.

development projects typically include the reasonably foreseeable effects of various phases in the process, such as . . . using the resource."[56] CEQ specifically identifies the combustion of fossil fuels as an indirect effect of a lease sale on federal lands.[57]

In addition to this analysis and given the potential magnitude of their indirect effects, BOEM must assess the lease sale decision in the context of the science that shows the majority of fossil fuels must be left undeveloped to avoid the worst effects of climate change and national and international commitments to keep climate warming well below 2 °C. CEQ's guidance affirms the need for agencies to assess fossil fuel extraction decisions in the context of the nation's climate goals, commitments, and policies. It directs agencies to "discuss relevant approved federal, regional, state, tribal, or local plans, policies, or laws for [greenhouse gas] emission reductions or climate adaptation to make clear whether a proposed project's [greenhouse gas] emissions are consistent with such plans or laws."[58] "This approach helps frame the policy context for the agency decision based on its NEPA review."[59]

BOEM also should assess the lease sale's climate effects using the social cost of carbon. Developed by a federal interagency working group, the social cost of carbon is an estimate of the monetized damages from an incremental increase in carbon emissions in a given year, which includes—but is not limited to—climate-related changes in net agricultural productivity, human health, property damages from increased flood risk, and the value of ecosystem services.[60] The social cost of carbon provides a harmonized, interagency metric that can give decision makers and the public useful information for their NEPA review."[61] Although NEPA does not require a cost-benefit analysis, where, as here, an agency chooses to quantify the economic advantages of

[56] *Id.* at 14; *see also Mid States Coal. for Progress v. Surface Transp. Bd.*, 345 F.3d 520, 549-50 (8th Cir. 2003) (concluding that it would be "irresponsible for the [agency] to approve a [railroad line providing access to coal mining areas] of this scope without first examining the effects that may occur as a result of the reasonably foreseeable increase in coal consumption").
[57] *See* CEQ Guidance at 16 n.42; *see also High Country Conservation Advocates v. U.S. Forest Serv.*, 52 F. Supp. 3d 1174, 1196-98 (D. Colo. 2014) (holding that NEPA requires an assessment of the climate consequences of the end use of coal from potential future mining under an exemption from the Colorado Roadless Rule).
[58] CEQ Guidance at 28-29. *See also* 40 C.F.R.§§ 1502.16(c), 1506.2(d) (where an inconsistency exists, agencies should describe the extent to which the agency will reconcile its proposed action with the plan or law).
[59] CEQ Guidance at 29.
[60] Interagency Working Group on Social Cost of Carbon, U.S. Government, Technical Support Document: - Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis - Under Executive Order 12866 at 2 (July 2015 revision).
[61] CEQ Guidance at 33 n.86. The Fourth Circuit recently upheld the Department of Energy's use of the social cost of carbon in establishing energy efficiency standards for commercial refrigeration equipment. *See Zero Zone, Inc. v. U.S. Dep't of Energy*, Nos. 14-2147, 14-2159 & 14-2334, 2016 WL 4177217, at *15-16 (4th Cir. Aug. 8, 2016).

the proposed action, it is arbitrary and inconsistent with NEPA's requirements to ignore the social cost of carbon emissions.[62]

As described herein, BOEM makes no attempt to estimate the indirect effects of the proposed action on climate change, and it irrationally ignores existing policy direction and omits the social cost of carbon from a document that presents benefits in monetary terms. For these reasons, the agency fails to satisfy NEPA's requirements.

A. The Draft EIS fails to analyze the effects of the proposed action on climate change.

BOEM disavows its NEPA obligation to consider the indirect effects of the proposed action on climate change:

> It is acknowledged that some portion of the oil and gas produced from Lease Sale 244 leases would be consumed as fuel; however, because end use consumption is not part of the Proposed Action, and because any attempt to quantify a marginal increase in national oil and gas consumption (much less resulting environmental effects) attributable to Lease Sale 244 oil and gas would be unduly speculative, this EIS does not attempt to quantitatively analyze or model environmental effects from the end use consumption of produced oil and gas.[63]

It doubles down on this assertion in its discussion of the cumulative effects of the proposed action on air quality:

> The cumulative impacts analysis does not analyze impacts associated with end use consumption of oil and gas resources which may be produced as a result of this lease sale. . . . NEPA does not require analysis of impacts that are not a direct, indirect or cumulative effect of the Proposed Action. Furthermore, current methods and models for predicting end use impacts are too speculative and unreliable to require inclusion in this EIS. Based upon analysis in the 2012-2017 Five Year Program, BOEM's best estimate is that even making the entire U.S. OCS unavailable for leasing would result in a decrease in consumption equivalent only to 2 months of current U.S. consumption over the course of 40-50 years. Where the qualities and quantities of fossil fuel to be produced are surrounded by so many unknowns, where no generally accepted methodology for reliably calculating end use impacts exists, and where BOEM's findings indicate

[62] *See High Country Conservation Advocates*, 52 F. Supp. 3d at 1191 (noting that the agency had estimated the revenues, royalties, payroll, and local payment for goods and services that would be forgone under the no-action alternative but failed to account for the costs of carbon emissions).
[63] Draft EIS at 2-45; *see also id.* at 4-12 (making the same statement in the description of impact-producing factor of greenhouse gas emissions).

> there would be little to no impact on fossil fuel consumption as a result of this lease sale, NEPA does not require an end use analysis.[64]

Agencies must, however, analyze indirect effects that are by definition "not part of the Proposed Action."[65] Further, cumulative impacts may be relatively minor when viewed in isolation yet significant in combination.[66] BOEM's stated reasons for ignoring the effects of the consumption of oil and gas on climate change fall flat.

Nor would an assessment of the end-use impacts of oil and gas production prove "too speculative and unreliable."[67] CEQ guidance recommends that, "[t]o compare a project's estimated direct and indirect emissions with GHG emissions from the no-action alternative, agencies should draw on existing, timely, objective, and authoritative analyses," or any other available information.[68] "[T]he level of effort should be proportionate to the scale of the emissions relevant to the NEPA review."[69] As discussed above, a recent report by the Stockholm Environment Institute analyzes the effects on global consumption of forgoing production of oil on federal lands.[70] BOEM has already developed a scenario predicting the amount of oil that would be produced under the proposed action.[71] Given this work, it would not be difficult for the agency to calculate the greenhouse gas emissions that would likely be caused by a lease sale in Cook Inlet.[72] BOEM's failure to do so in the draft EIS deprives the public and decision-makers of critical information about one of the proposed action's most significant environmental impacts.

B. The Draft EIS fails to place the proposed action's climate impacts in the context of relevant policy direction or to monetize these impacts' costs.

The Draft EIS nowhere mentions the United States' climate commitments, or how production of oil and gas from Cook Inlet would, or would not, be consistent with them. That overarching policy direction reflects an international scientific consensus that there is a limit to the amount of carbon we can introduce into the atmosphere and still have a chance of keeping warming below 1.5 to 2 °C. The proposed action will affect whether or how that carbon budget is met or exceeded, because meeting the budget—and avoiding the worst effects of climate change—potentially will require forgoing other fuel development. Thus, BOEM's analysis will have to ask a set of questions about how the choice to pursue the oil and gas in the Cook Inlet OCS relates to the overall carbon budget and to decisions about whether to pursue other fossil fuels in light of the reality that a vast majority of already-discovered fossil fuels must be left

[64] *Id.* at 5-30.
[65] *See* 40 C.F.R. § 1508.8(b).
[66] *Id.* § 1508.7.
[67] Draft EIS at 5-30.
[68] CEQ Guidance at 16.
[69] *Id.* at 17.
[70] *See supra* note 25 & accompanying text.
[71] *See* Draft EIS at 2-21 (estimating total oil production of 150 to 215 million barrels).
[72] *See* CEQ Guidance at 11-13.

undeveloped. It must examine the project in the context of bringing the nation's supply-side energy policies in line with its international commitment to combat climate change.

Furthermore, because BOEM does not estimate the total greenhouse gas emissions that consumption of fossil fuels from the lease sale would cause, it also omits any accounting of the costs those emissions would impose on society. The agency monetizes the benefits of the proposed action, including direct and indirect earnings for each project year[73] and nearly $11 billion in total government revenues from royalties and taxes.[74] Converting the range of global greenhouse gas emissions expected to be caused by the lease sale to a social cost, in dollars, would provide a useful comparator for these economic boons. The analysis as presented is skewed in favor of holding the sale, and it is therefore both arbitrary and contrary to NEPA's goals.[75]

IV. BOEM DOES NOT ADEQUATELY DESCRIBE HOW CLIMATE CHANGE COULD WORSEN THE PROPOSED ACTION'S IMPACTS

NEPA requires that an EIS describe the environment that would be affected by the proposed action,[76] taking climate change into account. "The current and projected future state of the environment without the proposed action (i.e., the no action alternative) represents the reasonably foreseeable affected environment, and this should be described based on authoritative climate change reports."[77] Communities and ecosystems that are already experiencing climate-related stresses may be more susceptible to environmental harms.[78] BOEM must therefore explain in detail how climate change could exacerbate the proposed action's impacts.

In its discussion of cumulative impacts, the agency repeatedly glosses over the effects of climate change and fails to consider how climate change would interact with the impacts of oil and gas activities to produce additive or synergistic harms. For example, the Draft EIS observes that climate change will likely affect the habitat, behavior, abundance diversity, and distribution of fish and shellfish species, and that the proposed action could contribute to these effects.[79] It does not, however, discuss how climate change might worsen impacts previously disclosed, such as degradation of water quality. This omission is problematic, as a report by the United Nations Environment Programme concludes that climate change could "severely exacerbate the combined impacts of" other sources of ocean pollution.[80] Likewise, the Draft EIS notes several harmful effects of climate change on birds without meaningfully assessing interactions with the proposed action's impacts.[81] Studies have shown, however, that pollution events such as oil

[73] Draft EIS at 4-171, Tbl. 4.3.2-22; *id.* at 4-172, Tbl. 4.3.2-24.
[74] *Id.* at 4-173.
[75] *See High Country Conservation Advocates*, 52 F. Supp. 3d at 1191.
[76] *See* 40 C.F.R. § 1502.15.
[77] CEQ Guidance at 20-21.
[78] *Id.* at 21.
[79] *See* Draft EIS at 5-41 to 5-42.
[80] Nellemann, C. *et al.*, In Dead Water: Merging of Climate Change with Pollution, Over-Harvest, and Infestations in the World's Fishing Grounds at 57 (2008).
[81] *See* Draft EIS at 5-51.

spills "can act in combination with broad-scale oceanographic and climatic conditions to influence seabird demography."[82] The discussion of the cumulative effects of climate change on marine mammals,[83] coastal and estuarine habitats,[84] subsistence,[85] public health,[86] recreation and tourism,[87] archaeological and historic resources,[88] and environmental justice[89] is similarly superficial. BOEM must conduct a more thorough analysis of these effects to comply with NEPA.

V. BOEM OMITS ESSENTIAL INFORMATION ABOUT THE IMPACTS OF THE PROPOSED ACTION ON MARINE MAMMALS

NEPA requires agencies to present in their EISs information "relevant to reasonably foreseeable significant adverse impacts" if that information is "essential to a reasoned choice among alternatives and the overall costs of obtaining it are not exorbitant."[90] Information about environmental impacts is "essential" if it is necessary to allow policymakers and the public to make an informed comparison of the alternatives[91] or to permit development of alternatives that minimize impacts.[92] At the lease sale stage, information is essential if it is needed to assess the effects of oil and gas development in different areas under consideration. Without that

[82] Stephen C. Votier *et al.*, *Oil Pollution and Climate Have Wide-Scale Impacts on Seabird Demographics*, 8 ECOLOGY LETTERS 1157, 1161 (2005).
[83] Draft EIS at 5-44 to 5-45.
[84] *See id.* at 5-52 to 5-53.
[85] *See id.* at 5-61.
[86] *See id.* at 5-66 to 5-67.
[87] *See id.* at 5-68 to 5-70.
[88] *See id.* at 5-75 to 5-76.
[89] *See id.* at 5-83 to 5-84.
[90] 40 C.F.R. § 1502.22.
[91] *See id.* § 1502.14 (requiring an EIS to "present the environmental impacts of the proposal and the alternatives in comparative form, thus sharply defining the issues and providing a clear basis for choice among options by the decisionmaker and the public"); *see also Se. Alaska Conservation Council v. Fed. Highway Admin.*, 649 F.3d 1050, 1058 (9th Cir. 2011) (holding that an EIS that failed to consider a reasonable alternative violated NEPA because it "fail[ed] to provide policymakers and the public with sufficient information to make an informed comparison of the alternatives" (internal quotation marks and citation omitted)).
[92] *See* 40 C.F.R. § 1502.1 (requiring an EIS to "inform decisionmakers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment"); *see also Native Ecosystems Council v. U.S. Forest Serv.*, 418 F.3d 953, 965 (9th Cir. 2005) (remanding decision to agency where lack of accurate information rendered an EIS unable to "inform[] decisionmakers and the public of the reasonable alternatives which would avoid or minimize adverse impacts") (internal quotation marks and citation omitted); *Muckleshoot Indian Tribe v. U.S. Forest Serv.*, 177 F.3d 800, 810 (9th Cir. 1999) (noting that an EIS must analyze "effects of the actions in sufficient detail to be 'useful to the decisionmaker in deciding whether, or how, to alter the program to lessen cumulative impacts.'") (quoting *City of Carmel-by-the-Sea v. U.S. Dep't of Transp.*, 123 F.3d 1142, 1160 (9th Cir. 1997)).

information, BOEM cannot effectively compare alternatives that offer different areas for leasing or develop alternatives that minimize adverse effects.[93]

Information on the effects of active acoustic sources (*i.e.*, seismic airguns, acoustical positioning systems, subbottom profilers, and multibeam echosounders) on marine mammals in Cook Inlet is currently insufficient to allow a reasoned decision as to the areas, if any, that should be offered in this sale. The Draft EIS acknowledges that "there may be some incongruity between models and detailed field measurements," but concludes that "[c]urrent models use the best available science to be applied at appropriate levels and without unnecessary costs and delays required for more detailed analysis."[94] It then proceeds to list generic measurements of sound pressure levels and sound exposure levels for various configurations of sources.[95] This analysis is insufficient for several reasons.

First, it presents no modeling of sound propagation and its impacts on habitat within Cook Inlet. Although the Draft EIS maintains that modeling is a "powerful tool used in predictive assessment of acoustic impacts," it does not reference any modeling in Cook Inlet.[96] Even if it had, it should have more fully disclosed the limitations of acoustic modeling: the sources cited in the Draft EIS indicate that "[u]nderwater sound propagation is complex and dependent on numerous factors, such as, but not limited to, water depth, bottom type and relief, surface reflection, [and] absorption and sound speed profile."[97] Thus, modeling of the acoustic effects of active noise sources depends on area-specific environmental characteristics and is inherently imprecise.[98] In addition, it frequently does not reflect the phenomenon of reverberation, which may elevate sound above ambient levels between seismic airgun shots.[99] BOEM should have conducted modeling specific to Cook Inlet and presented the results in the Draft EIS, recognizing its limitations.

[93] *Cf. Pac. Rivers Council v. U.S. Forest Serv.*, 2012 WL 2333558, at *16-17 (9th Cir. June 20, 2012) (admonishing that "programmatic NEPA documents often play a 'shell game' of when and where deferred issues will be addressed" and holding early-stage EIS that deferred analysis of effects that were "reasonably possible" to analyze at this stage violated NEPA), *vacated and dismissed as moot sub nom.*, *U.S. Forest Serv. v. Pac. Rivers Council*, 133 S. Ct. 2843 (2013). *See Rosenbloom v. Pyott*, 765 F.3d 1137, 1154 n.14 (9th Cir. 2014) ("decisions vacated for reasons unrelated to the merits may be considered for the persuasive [sic] of their reasoning").
[94] Draft EIS at 4-37.
[95] *See id.*
[96] *Id.* at 4-37.
[97] L. A. M. Aerts & B. Streever, *Modeled and Measured Underwater Sound Isopleths and Implications for Marine Mammal Mitigation in Alaska*, *in* The Effects of Noise on Aquatic Life 9, 13 (A. N. Popper & A. Hawkins, eds. 2016), http://www.ncbi.nlm.nih.gov/pubmed/26610939.
[98] *See id.*
[99] M. Guerra *et al.*, *Quantifying Seismic Survey Reverberation Off the Alaskan North Slope*, 130 J. ACOUSTICAL SOC'Y AM. 3046, 3047 (2011) (Guerra *et al.*). The Navy has previously attempted to account for reverberation in site-specific modeling of sound propagation in an EIS for training activities. *See* U.S. Naval Facilities Engineering Command, Northwest, Northwest Training and Testing Activities Final Environmental Impact Statement/Overseas Environmental Impact Statement at App. I, at I-195 (Oct. 2015).

Actual measurements of acoustic impacts in Cook Inlet are also lacking. The Draft EIS presents data on the propagation of sound from two configurations of seismic airgun arrays previously used in Cook Inlet.[100] These data, however, do not capture the full effects of repeated blasts from seismic arrays within a partially enclosed basin such as Cook Inlet. As the preeminent scientists on marine mammal bioacoustics and behavioral ecology explain:

> An example of the outdated impact assessment methodology is the use of the sound level of the seismic impulse itself as the cause for concern. It is now well known that, as a result of reflection and reverberation, energy from the impulse spreads into the time gaps between impulses and raises the background noise level by 30-45 dB throughout those gaps within at least 1 km of the survey and by 20-25 dB within 25-50 km from the survey. Furthermore, a rise in background noise level can extend out to >100 km from the seismic source, dramatically altering the low-frequency acoustic environment for the duration of the survey. Thus, restricting an assessment of a seismic survey to only the specific impulse (< 1 sec), within a restricted dB isopleth (160 dB) is simply wrong and scientifically unsound.[101]

The Draft EIS acknowledges the study the scientists reference, but there the seismic survey was conducted in the open water in the Beaufort Sea[102]—not in a basin closed off on three sides. Additional, more-comprehensive measurements of both punctuated and background noise from a wide variety of seismic arrays and other equipment in Cook Inlet are needed to assess the impacts of potential oil and gas activities on the acoustic environment.

On a larger scale, the Draft EIS also fails to assess the combined effects of marine seismic surveys, geohazard surveys, acoustical positioning, and other activities. As the aforementioned scientists observe:

> [I]t is scientifically indefensible that any current assessment of the environmental effects of a seismic survey considers only the individual activity (*e.g.* a single survey), rather than the aggregate of all activities that contribute to the acoustic environment. This single-activity approach applies simplistic methods based entirely on expected maximum sound exposure levels at points in time and uses decades-old guidelines. It does not adequately integrate the full extent of the impacts over time, over space or across frequency domains.[103]

[100] Draft EIS at 4-81.
[101] D. Nowacek *et al.*, Comment Letter regarding Notice of Receipt of Applications for Incidental Harassment Authorization ("IHA") for Geophysical Surveys in the Atlantic Ocean at 2 (July 29, 2015) (undated) (Nowacek *et al.*).
[102] *See* Guerra *et al.* at 3047.
[103] Nowacek *et al.* at 2.

The Draft EIS discloses that the proposed action would likely involve one to two deep-penetrating marine seismic surveys and four to five geohazard surveys,[104] but it does not analyze the aggregate effects of these activities. Rather, it concludes that "[i]mpacts from the active sound source will cease as soon as the survey is complete and full recovery of the acoustic environment to pre-survey conditions is expected."[105] Instead of considering each activity in isolation, BOEM should assess their combined effects, taking into account likely timing, proximity, and similarity of frequencies.

Crucially, the discussion in the Draft EIS also fails to discuss in any depth the unknown effects of seismic and geohazard surveys and impacts on marine mammals. It notes that "prolonged or repeated airgun and sonar pulses on marine mammals might include . . . masking of natural sounds [and] behavioral disturbance," but it does not assess the likelihood of these impacts using a contextual response analysis.[106] Nor does it address the effects of elevated background noise from reverberation,[107] which may reduce the "communication space" between animals.[108] Recently developed methods may allow the quantification of such effects,[109] and BOEM should apply those methods to analyze the potential impacts of seismic surveys on marine mammals in greater detail.

Likewise, the Draft EIS glosses over potentially serious effects of chronic noise from active sound sources on marine mammals. It notes that "[l]ong-term exposure to airgun noise is suspected to have effects on marine mammals, including hearing loss and elevated stress levels," and that it could "elicit behavioral changes."[110] In a non sequitur, it downplays these impacts because "the likelihood of repeated exposures to pulsed noise from active airgun arrays remains very low since seismic vessels typically travel at 4-5 knots/hr, limiting the potential exposure to only a few pulses before the airgun noise drops below [NMFS's Level A hearing-impairment thresholds]."[111] This statement ignores the growing but limited understanding of behavioral and physiological effects of long-term, low-level noise on marine mammals:

> It is now well established that the sound level to which an animal is exposed, based either on empirical metrics or modeled estimates, is not the sole predictor of impact response, and that impact response is highly dependent on context. . . .
>
> Level B takes . . . often occur well outside of our ability to directly observe the disruption, and typically outside the 1,000 m observation zones around such disruptive activities. The best available science clearly shows that behavioral disruptions occur at vastly lower noise exposure levels than the current regulatory thresholds for Level B disturbances, and at much larger distances than on-board Marine Mammal Observers or passive acoustic monitoring can document.[112]

[104] Draft EIS at 4-37.
[105] *Id.* at 4-38.
[106] *See, e.g.*, W.T. Ellison *et al.*, *A New Context-Based Approach to Assess Marine Mammal Behavioral Responses to Anthropogenic Sound*, 26 CONSERVATION BIO. 21, 27-28 & Fig. 2 (2011).
[107] Draft EIS at 4-81.
[108] Guerra *et al.* at 3047.
[109] *See generally* C. W. Clark *et al.*, *Acoustic Masking in Marine Ecosystems: Intuitions, Analysis, and Implication*, 395 MARINE ECOLOGY PROGRESS SERIES 201 (2009).
[110] Draft EIS at 4-80.
[111] *Id.* at 4-81.

A recent study on bowhead whales revealed behavioral responses to seismic signals at great distances and relatively low sounds levels.[113] These findings are transferable to related species such as right whales,[114] and, to the extent that BOEM is not able to document behavioral and physiological effects of long-term active sound sources on all species of potentially affected marine mammals, it should generalize from the latest science.[115]

Finally, the Draft EIS does not sufficiently analyze the cumulative effects of sound from all sources in Cook Inlet on marine mammals. Sub-bottom profilers, support vessels, undersea communication systems, and shipping vessels all add to the aggregate sound field that can harm marine mammals.[116] BOEM admits that such sources could directly affect marine mammals and that "[a]nthropogenic noise is ubiquitous in Cook Inlet," but it makes no effort to analyze the effects of that sound on marine mammals.[117] Tools are now readily available for modeling species' responses to aggregated exposure,[118] and BOEM should use these tools to assess the cumulative impacts of sound on marine mammals in the project area.

In sum, BOEM must provide a more complete analysis of the effects of active sound sources on both the acoustic environment and marine mammals in the FEIS. This information is "relevant to reasonably foreseeable significant adverse impacts,"[119] as the Draft EIS admits that "marine seismic surveys [could cause] the loss of acoustic habitat availability due to noise"[120] and, similarly, that marine mammals would respond to ongoing seismic surveys.[121] It is also "essential to a reasoned choice among alternatives,"[122] several of which are specifically designed to address the impacts of noise on the endangered Cook Inlet beluga whale.[123] NEPA therefore

[112] Nowacek *et al.* at 3.
[113] *Id.*; S. B. Blackwell *et al.*, *Effects of Airgun Sounds on Bowhead Whale Calling Rates: Evidence for Two Behavioral Thresholds.* 10 PLoS ONE 1, 20-21, 24 (2015).
[114] Nowacek *et al.* at 5.
[115] *See* 40 C.F.R. § 1502.22(b)(4).
[116] Nowacek *et al.* at 6.
[117] *See* Draft EIS at 5-43.
[118] *See, e.g.*, W. T. Ellison *et al.*, *Modeling the Aggregated Exposure and Responses of Bowhead Whales* Balaena mysticetus *to Multiple Sources of Anthropogenic Underwater Sound*, 30 ENDANGERED SPECIES RES. 95 (2016).
[119] 40 C.F.R. § 1502.22(a).
[120] Draft EIS at 4-38.
[121] *Id.* at 4-81.
[122] 40 C.F.R. § 1502.22(a).
[123] *See* Draft EIS at 2-6 to 2-9.

requires that the agency obtain and disclose the information, or apply the best available science, before holding a lease sale.[124]

VI. BOEM FAILS TO CONSIDER REASONABLE ALTERNATIVES AND MITIGATION MEASURES

The alternatives section is the "heart of the [EIS],"[125] and an agency is required to develop alternatives that would minimize harm to the environment.[126] An agency must also identify "appropriate mitigation measures not already included in the proposed action or alternatives,"[127] taking a "hard look" at these possible measures; a "perfunctory description" does not suffice.[128] The Draft EIS violates NEPA by omitting reasonable alternatives and mitigation measures that would reduce the impacts of oil and gas development in the project area.

As an initial matter, the alternative that BOEM intends to be the most protective of the endangered Cook Inlet beluga whale irrationally omits beneficial restrictions included in another alternative. Alternative 3C (beluga whale nearshore feeding areas mitigation) would apply Alternative 3B's (beluga whale critical habitat mitigation) seasonal ban on seismic surveys in critical habitat to all lease blocks; it would also extend the ban to most of the summer, during beluga whale migration, in blocks within ten miles of major anadromous streams.[129]

[124] *See* 40 C.F.R. § 1502.22. The agency cannot rely on protections under the Marine Mammal Protection Act (MMPA) or the Endangered Species Act to defer this analysis. As BOEM notes, the National Marine Fisheries Service has approved seismic surveys that rise to the level of behavioral harassment under the MMPA in the past, requiring further NEPA analysis. *See* Draft EIS at 4-81. Furthermore, as described below, NEPA prohibits BOEM from deferring analysis of mitigation measures to later processes; it requires the agency to identify and discuss mitigation in sufficient detail to ensure environmental consequences have been fairly evaluated.
[125] 40 C.F.R. § 1502.14; *'Ilio'ulaokalani Coal. v. Rumsfeld*, 464 F.3d 1083, 1095 (9th Cir. 2006).
[126] *Native Ecosystems Council v. U.S. Forest Serv.*, 418 F.3d 953, 965 (9th Cir. 2005) (remanding decision to agency where lack of accurate information rendered an EIS unable to "inform[] decisionmakers and the public of the reasonable alternatives which would avoid or minimize adverse impacts") (quoting *Klamath-Siskiyou Wildlands Ctr. v. Bureau of Land Mgmt.*, 387 F.3d 989, 993 (9th Cir. 2004))); *Muckleshoot Indian Tribe v. U.S. Forest Serv.*, 177 F.3d 800, 809-10 (9th Cir. 1999) (EIS must analyze "effects of the actions in sufficient detail to be 'useful to the decisionmaker in deciding whether, or how, to alter the program to lessen cumulative impacts.'" (quoting *City of Carmel-by-the-Sea*, 123 F.3d at 1160)); *see also* 40 C.F.R. § 1502.1 (binding NEPA regulations provide that an EIS must "inform decisionmakers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment"); *id.* § 1500.2(e) ("Federal agencies shall to the fullest extent possible . . . [u]se the NEPA process to identify and assess the reasonable alternatives to proposed actions that will avoid or minimize adverse effects of these actions . . . .").
[127] 40 C.F.R. § 1502.14(f); *see also id.* § 1502.16(h).
[128] *Okanogan Highlands All. v. Williams*, 236 F.3d 468, 473 (9th Cir. 2000).
[129] Draft EIS at 2-6.

Inexplicably, however, Alternative 3C does not prohibit exploration drilling at any time of year on any OCS blocks, whereas Alternative 3B does.[130] BOEM must consider the reasonable alternative of restricting both marine seismic surveys and exploration drilling on all OCS blocks during the winter, and on blocks near anadromous streams during the summer as well.

Further, the agency weakens Alternatives 3C (beluga whale nearshore feeding areas mitigation) and 4B (northern sea otter critical habitat mitigation) by allowing waivers to or variances from protective stipulations where lessees propose "commensurate" adaptive management strategies.[131] Vague references to possible future mitigation measures do not satisfy NEPA's requirements, however,[132] and the agency should discuss in greater detail the types of strategies it might approve. The public and decision-makers must have an opportunity to evaluate the efficacy of potential mitigation when weighing the various leasing configurations the agency has proposed.

The agency should also include alternatives that would reduce the potential impacts on non-listed species within the project area. For example, the Draft EIS notes that there is a ten percent chance that a large oil spill could reach the Outer Kachemak Bay Important Bird Area under the proposed action, with potentially devastating death tolls on birds.[133] BOEM should discuss possible spatial alternatives that would lower the likelihood of these and other catastrophic effects of oil spills on wildlife, rather than limit the options considered to those that might benefit the two species with designated critical habitat within the project area.

Regarding mitigation, the Draft EIS discloses a recommendation made during the scoping period that BOEM restrict lease activities during migratory, breeding, and birthing periods, presumably of cetaceans such as the Cook Inlet beluga whale.[134] The agency responds that Alternatives 3B and 3C include restrictions on seismic and exploration activities, with the latter alternative imposing additional measures during fish-spawning season.[135] It observes that "[n]o other timing restrictions relevant to migratory, breeding, or birthing periods were identified."[136] These statements not only fail to respond to the request for measures protecting *belugas'* breeding and birthing periods, but also improperly shifts its responsibility to formulate mitigation measures to the public. BOEM must consider protections for beluga whales and other species

[130] *See id.*
[131] *Id.* at 2-9, 2-10 to 2-11.
[132] *See Pac. Coast Fed'n of Fishermen's Ass'ns v. Blank*, 693 F.3d 1084, 1104 (9th Cir. 2012) ("Mitigation must be discussed in sufficient detail to ensure that environmental consequences have been fairly evaluated." (quoting *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 352 (1989))); *cf. Protect Our Cmtys. Found. v. Jewell*, 825 F.3d 571, 582 (9th Cir. 2016) (holding that an agency's "mitigation measures, including [an] 85-page Protection Plan, provide ample detail and adequate baseline data for the agency to evaluate the overall environmental impact of the Project").
[133] Draft EIS at 4-156 to 4-157.
[134] *Id.* at 2-43, Tbl. 2.6.4-1.
[135] *Id.* This statement is somewhat misleading, however, because Alternative 3C does not limit activities other than marine seismic surveys.
[136] Draft EIS at 2-43, Tbl. 2.6.4-1.

during breeding and calving periods, especially where belugas use parts of Cook Inlet near the project area.[137]

VII. BOEM DOES NOT TAKE A HARD LOOK AT THE LEASE SALE'S EFFECTS ON ENDANGERED COOK INLET BELUGA WHALES

Cook Inlet beluga whales are genetically distinct and geographically isolated and live only in Cook Inlet.[138] The population of Cook Inlet beluga whales has declined precipitously in the last 30 years. In 1979, the estimated population of Cook Inlet beluga whales was approximately 1,300.[139] By 2014, the population had dropped by more than 75% to only 340 whales.[140] Despite a cessation of subsistence hunting in 1999, the population of Cook Inlet beluga whales has not rebounded. In fact, it declined at an average rate of 0.4% per year over the past decade.[141] In response to the whales' continuing decline, the National Marine Fisheries Service (NMFS) conducted an expert status review and concluded that Cook Inlet beluga whales had a 26% probability of extinction in 100 years and a 70% probability of extinction in 300 years.[142] Based on that finding and evidence that human development—including oil and gas exploration—pose a serious threat to the whale's survival, NMFS listed the Cook Inlet beluga whale as an endangered species in 2008,[143] and designated 3,016 square miles of critical habitat in 2011.[144]

NMFS recently reaffirmed the precarious state of Cook Inlet beluga whales when it proposed issuing a programmatic environmental impact statement that would analyze the multitude of anthropogenic activities (including the expected increase in activities) over multiple years, expressing "concern" about the "lack of recovery" of the whales. 79 Fed. Reg. 67616, 61617 (Oct. 14, 2014). NMFS has also admitted that "[i]t is not known what specific factor or combination of factors continue to limit [the Cook Inlet beluga] population's growth."[145]

The Draft Recovery Plan for the Cook Inlet beluga whale, issued in 2015, lists ten threats to beluga whales, at least six of which will be magnified by the activities that would occur under Lease Sale 244: reduction in prey, pollution, noise, habitat loss or degradation, catastrophic events, and cumulative and synergistic effects of multiple stressors.[146] Despite the long list of

[137] *See* H. P. Huntington, *Traditional Knowledge of the Ecology of Belugas*, Delphinapterus leucas, *in Cook Inlet, Alaska*, 62 MARINE FISHERIES REV. 134, 137 (2000) (noting that Cook Inlet beluga whale calving areas include the northern side of Kachemak Bay in April and May).
[138] 76 Fed. Reg. 20180, 20181 (Apr. 11, 2011).
[139] NMFS, Conservation Plan for the Cook Inlet Beluga Whale (*Delphinapterus leucas*) (2008) (NMFS, Conservation Plan).
[140] Shelden, K.E.W. *et al.*, Aerial Surveys of Beluga Whales (*Delphinapterus Leucas*) in Cook Inlet, Alaska, June 2014 (2015), http://www.afsc.noaa.gov/Publications/ProcRpt/PR2015-03.pdf.
[141] *Id.*
[142] 73 Fed. Reg. at 62927.
[143] *Id.*
[144] 73 Fed. Reg. 62919 (Oct. 22, 2008); 76 Fed. Reg. 20180 (Apr. 11, 2011).
[145] NMFS, Conservation Plan at 2.
[146] NMFS, Draft Recovery Plan for the Cook Inlet Beluga Whale (*Delphinapterus leucas*) (May 15, 2015) (Draft Recovery Plan).

threats to Cook Inlet beluga whales and their uncertain future, the Draft EIS fails to take a hard look at how Lease Sale 244 will affect the whales. The Draft EIS does not analyze or disclose the myriad threats oil and gas exploration and development under Lease Sale 244 pose for beluga whales. Specifically, BOEM has failed to take a hard look at: (1) how the lease sale will impair beluga whales' critical habitat and hinder recovery; (2) the effects of noise from oil and gas activities on beluga whales; (3) the effects of oil spills on beluga whales; and (4) cumulative and synergistic effects on beluga whales. For all of these reasons, the Draft EIS is inadequate.

A. BOEM does not take a hard look at how the lease sale will impair beluga whales' critical habitat and hinder recovery.

Lease Sale 244 overlaps Cook Inlet beluga critical habitat and extends into non-critical habitat areas that were historically important to beluga whales and where they have been seen in recent years. According to the Marine Mammal Commission's 2014 comment letter on Lease Sale 244 scoping,

> Historical records indicate that beluga whales used to be found throughout Cook Inlet (Laidre et al. 2000). However, since the mid 1990's their range has contracted to the upper portion of the inlet, north of East and West Foreland (Rugh et al. 2010). Nevertheless, there have been beluga whale sightings in recent years in the mid-inlet, in close proximity (50-60 km) to the Cook Inlet lease sale area. In May 2012, NMFS aerial survey observers spotted seven beluga whales southeast of West Foreland moving toward Trading Bay (Hobbs et al. 2012, Shelden et al. 2013). Photo-identification surveys conducted in 2011-2013 encountered seven groups ranging in size from four to ten whales, including calves, in the Kenai River Delta, with whales observed feeding on salmon in the Delta on at least one occasion. Industry-conducted monitoring of oil and gas activities at the Cosmopolitan drilling site (near Anchor Point) detected one beluga whale in August 2013 (Owl Ridge Natural Resource Consultants 2014). Two other incidental sightings of beluga whales in the lower inlet were of a single animal in February 2013 in the Kenai River and a group south of Ninilchik in March 2013 (McGuire et al. 2014).[147]

The Marine Mammal Commission therefore recommended BOEM either defer the lease sale or restrict it to areas south of Anchor Point.[148] Beluga whales historically ranged throughout Cook Inlet and presumably would extend their range again if their population began to rebound. Oil and gas activities in the mid-inlet would provide a barrier to such range extension. Although the Draft EIS recognizes the possibility that beluga whales may move back into the lease sale area as their numbers rebound, it asserts that oil and gas activities have the potential only to "have adverse effects on the health and fitness of a few individual beluga whales."[149] This

[147] Lent, R., Executive Director, Marine Mammal Commission, Comments to M. Rolland, BOEM (Dec. 8, 2014), http://www.mmc.gov/wp-content/uploads/EIS_CookInletLeas_120814.pdf.
[148] *Id.*
[149] Draft EIS at 4-102.

attempt at minimizing Lease Sale 244 as an impediment to beluga recovery does not meet NEPA's requirements that BOEM take a hard look at the effects of the action.

B. BOEM does not take a hard look at the effects of noise on beluga whales.

BOEM's analysis of seismic noise and other vessel disturbance to beluga whales is inadequate. Like all marine mammals, Cook Inlet beluga whales depend on sound for vital life functions—such as to navigate, find food, locate mates, avoid predators and communicate with each other. Artificial manmade noise introduced into their environment can disturb beluga whales and interfere with these important biological behaviors. NMFS has repeatedly warned that anthropogenic noise may impede the survival of Cook Inlet beluga whales.[150] The harmful effects of high-intensity anthropogenic noise include:

- strandings and other non-auditory physical injuries;
- temporary or permanent loss of hearing, which impairs an animal's ability to communicate, avoid predators, and detect and capture prey;
- avoidance behavior, which can lead to abandonment of habitat or migratory pathways;
- disruption of biologically important behaviors such as mating, feeding, nursing, or migration, or loss of efficiency in conducting those behaviors;
- aggressive (or agonistic) behavior, which can result in injury;
- masking of biologically meaningful sounds, such as the call of predators or potential mates;
- chronic stress, which can compromise viability, suppress the immune system, and lower the rate of reproduction;
- habituation, causing animals to remain near damaging levels of sound, or sensitization, exacerbating other behavioral effects; and
- declines in the availability and viability of prey species, such as fish.[151]

Although the Draft EIS summarizes some of the research on beluga whales and noise, it alternates between two contradictory rationales to say that Lease Sale 244's impacts will be

[150] 73 Fed. Reg. 63919, 62922 (Oct. 22, 2008) ("noise…may have some impact on this population…"); 74 Fed. Reg. 63080, 63087 (Dec. 2, 2009) ("Anthropogenic noise above ambient levels may cause behavioral reactions in whales (harassment) or mask communication between these animals…[noise] would be expected to have consequences to this DPS in terms of survival and recovery."); NMFS, Conservation Plan at 5 ("This Conservation Plan reviews and assesses the known and possible threats influencing Cook Inlet beluga whales…. Potential human impacts include subsistence harvest, poaching, fishing, pollution, vessel traffic, tourism and whale watching, coastal development, *noise*, oil and gas activities, and scientific research.") (emphasis added).
[151] For a review of research on behavioral and auditory impacts of undersea noise, *see, e.g.*, Richardson, W.J. *et al.*, *Marine Mammals and Noise* (2005); National Research Council, *Ocean Noise and Marine Mammals* (2003); Whale and Dolphin Conservation Society, *Oceans of Noise* (2004); Hildebrand, J., *Impacts of anthropogenic sound*, *in* Ragen, T.J. *et al.*, *Marine Mammal Research: Conservation beyond Crisis* at 101-123 (2006).

minor. On one hand, BOEM asserts that seismic surveys' impacts on beluga whales will be "negligible to minor" because, in part, beluga whales "in other areas have demonstrated a 20 km (12.4 mi) avoidance of seismic surveys."[152] In other words, beluga whales will not be harmed because they will avoid seismic surveys. This ignores the fact that avoidance itself can have negative impacts if it forces whales to abandon feeding, breeding, or other important activities. Moreover, this rationale contradicts BOEM's rationale for concluding that vessel traffic will not affect beluga whales: "Given the large number of vessels in Cook Inlet and the apparent habituation to vessels by Cook Inlet beluga whales and the other marine mammals that may occur in the area, vessel activity and noise from vessels are expected to have negligible to minor impacts to Cook Inlet beluga whales."[153] In other words, beluga whales will not be harmed because they will continue feeding, breeding, etc., regardless of oil and gas activity under Lease Sale 244. This ignores the fact that oil and gas activities generate high levels of noise that may harm beluga whales if they remain in the vicinity. While beluga whales may avoid certain activities at certain times and tolerate certain activities at certain times, neither avoidance nor habituation should lead to the conclusion that effects will be minor to negligible. BOEM's attempt to alternate between avoidance and habituation to rationalize its negligible effects conclusion is not persuasive and does not comply with NEPA.

C. BOEM does not take a hard look at the effects of oil spills on beluga whales.

The Draft Recovery Plan categorizes catastrophic events, such as oil spills, as a high level threat to beluga whales.[154] Yet the Draft EIS concludes that oil spills will have negligible effects on Cook Inlet beluga whales.[155] The Draft EIS's negligible effects conclusion is not rational because it relies on unsupported assumptions. First, the Draft EIS asserts that past oil spills have not affected Cook Inlet:

> Over the decades since oil and gas development began in Cook Inlet there have been incidents of large spills occurring in Cook Inlet, and some were much larger than either of the assumed large spill sizes for platforms or pipelines in the Proposed Action (ADNR, 2016). The lack of any chronic or major effects from such spills suggests any additive effects from one of the assumed large spill types would likewise have no significant effect.[156]

The Draft EIS provides no citation for this assertion, and it runs counter to a prevailing theory of beluga whale decline. As explained below, scientists believe that a combination of multiple stressors in Cook Inlet is contributing to beluga whale decline and failure to recover.[157] The accidental release of hydrocarbons into Cook Inlet is one of the stressors that may be affecting beluga whales.

[152] Draft EIS at 4-102.
[153] *Id.*
[154] Draft Recovery Plan at 93-96.
[155] Draft EIS at 4-103.
[156] Draft EIS at 5-44.
[157] *See infra* pp. 25-26..

Second, the Draft EIS claims that although beluga whales could be harmed if they came in contact with spilled oil, "[i]n all likelihood an oil spill would be contained, partially recovered, and perhaps burned, such that it is unlikely any belugas would be contacted by the spilled materials. For these reasons small or large spills should have a negligible level of effects on Cook Inlet beluga whales."[158] But all the evidence suggests just the opposite: current technology only allows for recovery of a small fraction of spilled oil, even under the best circumstances.[159] The Draft EIS's conclusions regarding the impacts of oil spills on beluga whales therefore are not rationally connected to the science on oil spill recovery technology.

D. BOEM does not take a hard look at cumulative and synergistic effects on beluga whales.

BOEM's cumulative impacts analysis is incomplete and inadequate. Although the Draft Recovery Plan recognizes that cumulative and synergistic effects are a high level threat to beluga whales, the Draft EIS does not even analyze the proposed action's cumulative effects on beluga whales. Nor does it disclose any of the specific activities that may act cumulatively and synergistically to affect Cook Inlet beluga whales and other species in the project area.

The Draft EIS paints a picture of a whale that is habituated to anthropogenic activity and therefore not likely to be affected by additional activity in Cook Inlet.[160] Although BOEM is correct that Cook Inlet is highly industrialized, scientists recognize that this high level of human disturbance is likely contributing to beluga whales' decline and failure to recover. There is no evidence to suggest that additional activities, such as those that will occur under Lease Sale 244, will not act on beluga whales in cumulative and synergistic ways. To the contrary, according to the Draft Recovery Plan,

> Given the increase of human activities in Cook Inlet and the presence of contaminants in Cook Inlet and [Cook Inlet] belugas, the trend for cumulative and likelihood of synergistic effects is increasing over time, with a high probability that these effects will increase with time. Cumulative and synergistic effects are categorized as a high level threat for [Cook Inlet] belugas due to the following: 1) multiple stressors occur year-round and throughout range of the CI beluga population; 2) uncertainty regarding the magnitude of future cumulative effects; 3) uncertainty over the mechanisms of existing and future synergistic effects (if any); 4) difficulty in detecting impacts attributable to cumulative and synergistic mechanisms; and 5) difficulty in mitigating cumulative and synergistic effects due to multiple stressors.[161]

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[158] Draft EIS at 4-103.
[159] *See* Nikiforuk, A. *Why We Pretend to Clean Up Oil Spills*, Smithsonian.com (July 12, 2016), http://www.smithsonianmag.com/science-nature/oil-spill-cleanup-illusion-180959783/?no-ist.
[160] *E.g.*, Draft EIS at 4-102 ("Given high existing levels of vessel traffic in Cook Inlet . . . it is unlikely that this level of increased activity from the Proposed Action would result in discernible disturbance of any beluga whales in areas where such vessel traffic was already occurring.").
[161] Draft Recovery Plan at 99.

BOEM has failed to disclose and analyze the myriad activities in Cook Inlet that may act cumulatively and synergistically with the effects of the proposed action. For example, NMFS recently issued a 5-year Incidental Take Authorization under the Marine Mammal Protection Act to Apache Alaska to harass up to 30 Cook Inlet beluga whales a year pursuant to oil and gas seismic surveys.[162] In addition to oil and gas development, a number of specific development projects are planned that would significantly increase encroachment, pollution, ship traffic and noise levels in Cook Inlet. Several of the actual or potential development projects include: the Pebble Mine Port and Marine Terminal in Iniskin Bay; Port of Anchorage expansion; Port MacKenzie expansion; Knik Arm Bridge; Chuitna Coal project with a marine terminal (including dumping mining waste and runoff); Seward Highway improvements along the Turnagain Arm; the south coastal trail extension in Anchorage; Diamond Point rock quarry near Iliamna and Cottonwood Bays; and the placement of a submarine fiber optic cable from Nikiski to Anchorage.

In order to comply with NEPA, BOEM must honestly assess how oil and gas activities conducted pursuant to Lease Sale 244 will act cumulatively and synergistically with the multitude of other ongoing and future activities in Cook Inlet that affect beluga whales.

VIII. BOEM FAILS TO EXAMINE THE DIFFICULTIES OF RECOVERING OIL, ESPECIALLY CHALLENGING IN COOK INLET

The Draft EIS fails to acknowledge the limits of oil spill clean-up and containment at sea, particularly in the cold, often ice-filled, and strongly tidal conditions that prevail in Cook Inlet. As a result, it impermissibly dismisses the potential harm such spills could cause. For example, it concludes "[i]n all likelihood an oil spill would be contained, partially recovered, and perhaps burned, such that it is unlikely any belugas would be contacted by the spilled materials. For these reasons small or large spills should have a negligible level of effects on Cook Inlet beluga whales."[163] The agency's dismissal of the threat of oil spills on the basis of effective containment and clean-up is unsupported. Indeed, the science, much of it the government's own, points to the exact opposite conclusions.

To take but a few examples: The Bureau of Safety and Environmental Enforcement has acknowledged that "containment and recovery at sea rarely results in the removal of more than a relatively small proportion of a large spill, at best only 10 – 15 [percent] of the spilled oil and often considerably less."[164] Elsewhere the agency explained that mechanical containment and

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[162] 81 Fed. Reg. 47,240 (July 20, 2016).
[163] Draft EIS at 4-103.
[164] Minerals Management Service, Technology Assessment & Research (TA&R) Project Categories, Mechanical Containment and Recovery at PDF 2-3 (Print screen of page as last updated on Apr. 21, 2010). After the *Deepwater Horizon*, BSEE removed with this statement from its website without explanation.

recovery in open water conditions typically recovers five to 30 percent of the spilled oil.[165] For example, in the Beaufort Sea Multiple-Sale Environmental Impact Statement, the agency explained that: "On average, spill-response efforts result in recovery of approximately 10-20 [percent] of the oil released to the ocean environment."[166]

The National Oceanic and Atmospheric Administration (NOAA) has cautioned that offshore mechanical containment and recovery rates rarely exceed 20 percent even under the best of circumstances. "Recovery rates of spilled oil in optimum situations (calm weather, in a harbor, rapid response) rarely exceed 20 percent, and response to spills in ice in remote areas is substantially more challenging."[167] NOAA also cautioned that "[o]n-scene response efforts may take days to weeks to implement, and are rarely effective."[168]

Industry sources confirm this understanding. According to the International Tanker Owners Pollution Federation, "containment and recovery at sea rarely results in the removal of more than a relatively small proportion of a large [oil] spill, at best only 10 – 15 [percent] and often considerably less."[169] After the *Exxon Valdez* disaster, for example, the recovery rate was closer to eight percent.[170] Even in the Gulf of Mexico, the mechanical recovery efforts during the *Deepwater Horizon* response only recovered three percent of the total amount of oil released.[171]

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[165] U.S. Dept. of the Interior, Minerals Management Service, Arctic Oil Spill Response Research and Development Program: A Decade of Achievement at PDF 14 (2009) (Decade of Achievement), http://www.uscg.mil/iccopr/files/MMSArcticResearch_2009.pdf ("5 to 30% for open ocean response without broken ice").
[166] Minerals Management Service, Alaska Outer Continental Shelf, Beaufort Sea Planning Area, Oil and Gas Lease Sales 186, 195, and 202, Final Environmental Impact Statement, at IV-17 (Feb. 2003), http://www.boem.gov/About-BOEM/BOEM-Regions/Alaska-Region/Environment/Environmental-Analysis/2003_001.aspx.
[167] Lubchenco, J., Under Secretary of Commerce for Oceans and Atmosphere, Letter to S. Elizabeth Birnbaum, Director, Minerals Management Service, at 6 (Sept. 21, 2009).
[168] *Id.*
[169] *See* International Tanker Owners Pollution Federation, Limitations of Containment & Recovery at PDF 1 (Print screen of page as last updated on July 20, 2011). A more recent version of the web site similarly states that "key challenges" for oil containment and recovery "commonly combine to limit the proportion of oil spilled that can be recovered to 10-15 [percent]." *See* International Tanker Owners Pollution Federation, Containment & Recovery, http://www.itopf.com/knowledge-resources/documents-guides/response-techniques/containment-recovery/.
[170] Wolfe, D.A. *et al.*, *The Fate of the Oil Spilled from the Exxon Valdez*, 28 Env. Sci. & Tech. 13, 561A, at 563A (1994); *id.*, 567A (even total recovery and disposal constituted only 14 percent).
[171] Lubchenco, J. *et al.*, BP Deepwater Horizon Oil Budget: What Happened to the Oil? (Aug. 4, 2010) Fig. 1, http://www.noaanews.noaa.gov/stories2010/PDFs/OilBudget_description_%2083final.pdf.

A November 2010 report entitled "Beaufort Sea Oil Spills State of Knowledge Review and Identification of Key Issues"[172] reviewed the current state of the knowledge about oil spills. It explained that containment and recovery for spill response "has significant limitations when used for large spills in either temperate or Arctic locations" and noted "[t]here is a growing recognition of the limitations of [containment and recovery] for large spills."[173] It described the challenges of "[e]ncounter rate limitations."[174] In any large oil spill, the oil "rapidly spread[s] to form a thin layer on the water surface. The problem is worse for blowout spills, where the initial spill condition may be an average slick thickness in the range of 0.001 mm to 0.01 mm."[175] These problems are exacerbated in cold-water and ice conditions that may prevail in Cook Inlet. According to the Bureau of Safety and Environmental Enforcement, in broken ice conditions, oil spill recovery rates drop dramatically to between "1 [percent] to 20 [percent] depending on the degree of ice coverage and if responding during freeze-up or spring break-up."[176]

Following spill exercises in the Beaufort Sea in 2000, the Nuka Research & Planning Group explained:

> [T]he limit to mechanical recovery with containment booms and skimmers in ice-infested waters is generally considered to be 20-30% ice coverage (Figure 44). However, the 2000 offshore response exercises in the Alaska Beaufort Sea demonstrated that the actual operating limits were closer to 10%, and that during fall freeze-up, ice conditions as low as 1% constituted the operating limit for a barge-based mechanical recovery system using conventional boom and skimmers[.] In addition to ice coverage, the characteristics of the ice regime are an important determinant of response efficiency. The 2000 offshore exercises demonstrated that fall ice conditions (freeze-up) can be more challenging than spring break up (Robertson and DeCola 2001, NRC 2003a). Therefore, 10% ice coverage in fall may pose different limits than 10% coverage in spring.[177]

After the *Deepwater Horizon* disaster, and roughly ten years after the Beaufort Sea oil spill exercises, Pew Environmental Group commissioned a report that reached the same

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[172] The authors of this report, SL Ross Environmental Research and DF Dickins Associates, have served as consultants for BSEE dating back twenty years. *See, e.g.*, http://www.slross.com/publications/MMSStudiesNF.htm ("Since 1988, SL Ross has been a major participant in the [BSEE] Technology Assessment & Research (TAR) program."); DF Dickins, Oil Spill Projects, http://www.dfdickins.com/oilspills.html.
[173] SL Ross Environmental Research Ltd., DF Dickins Associates LLC., Envision Planning Solutions Inc. 2010, Beaufort Sea Oil Spills State of Knowledge Review and Identification of Key Issues, Environmental Studies Research Funds Report No. 177, at 29-30 (Nov. 2010) (Beaufort Knowledge Review), http://www.esrfunds.org/pdf/177.pdf.
[174] *Id.* at 30.
[175] *Id.*
[176] Decade of Achievement at PDF 14.
[177] Nuka Research & Planning Group, LLC., Oil Spill Response Mechanical Recovery Systems for Ice-Infested Waters: Examination of Technologies for the Alaskan Beaufort Sea at 58 (June 2007), http://www.dec.state.ak.us/spar/ipp/docs/2007%20Mechanical%20Recovery%20Ice.pdf.

troubling conclusions regarding mechanical cleanup in ice infested seas, in this case in the Arctic Ocean:

> If a major blowout were to occur in the Arctic OCS, the same mechanical cleanup techniques [as those used in the Deepwater Horizon spill response] (boats with skimmers and booms) would be applied at a much less efficient recovery rate. Although some refinements have been made to adapt certain types of equipment for use in cold or ice-infested waters, there have been no breakthroughs in oil spill response technologies to significantly enhance the capacity to recover oil when sea ice is present. The National Academy of Sciences (NAS) determined that 'no current cleanup methods remove more than a small fraction of oil spilled in marine waters, especially in the presence of broken ice' (National Research Council-NAS 2003).[178]

BOEM must account for the limits of oil spill response at sea in general and in the conditions that prevail in Cook Inlet in particular. Its failure to do so renders its impact conclusions arbitrary and in violation of NEPA.

IX. BOEM OVERLOOKS OR DISMISSES SEVERAL ADDITIONAL KEY ENVIRONMENTAL IMPACTS

EISs must "provide full and fair discussion of the significant environmental impacts of the proposed action."[179] "The [agency's] 'hard look' must be taken objectively and in good faith, not as an exercise in form over substance, . . . and the final EIS must include a 'discussion of adverse impacts that does not improperly minimize negative side effects.'"[180] Furthermore, because the Administrative Procedure Act (APA) governs the agency's preparation of an EIS, the agency must "articulate a rational connection between the facts put forth . . . and the choices made."[181] The Draft EIS fails to meet these standards in its discussion of a number of issues.

First, BOEM overlooks the harm that long-term noise may cause marine mammals in the form of increased stress levels. The Draft EIS notes that some cetaceans may be habituated to

[178] Nuka Research & Planning Group, LLC, Oil Spill Prevention and Response in the U.S. Arctic Ocean: Unexamined Risks, Unacceptable Consequences at 8 (Nov. 2010), http://www.pewtrusts.org/~/media/legacy/uploadedfiles/peg/publications/report/oil20spill20preventionpdf.pdf.
[179] *W. Watersheds Project v. Kraayenbrink*, 632 F.3d 472, 487 (9th Cir. 2010) (quoting 40 C.F.R. § 1502.1).
[180] *Id.* at 491 (citations omitted).
[181] *Id.* at 494-95; *see also id.* at 494 (quoting *Motor Vehicle Mfrs. Ass'n of the U.S. v. State Farm Mut. Auto. Ins.*, 463 U.S. 29, 42 (1983)).

dredging noise or tolerate slow-moving vessels,[182] but it does not discuss any studies documenting physiological evidence of stress in environments with chronic noise, such as background underwater noise from ship traffic.[183] Rather, it generally concludes that "[n]oise levels [from drilling] are normally too low in frequency or decibel level to produce physiological effects on marine mammals."[184] BOEM should provide a fuller discussion of the effects of a wider range of sources of long-term noise.

Along these lines, the Draft EIS repeatedly downplays the effects of oil and gas activities on cetaceans because these animals avoid areas where activities are happening.[185] Yet avoidance behavior and de facto loss of habitat (the extent of which is undisclosed in the Draft EIS) are themselves concerning effects on marine mammals. The agency's analysis in this regard is illogical, taking the form of a Catch-22: animals have to swim close enough to activities in order to be harmed by them, but if they do swim that close BOEM assumes they are not harmed by them.[186] This rationale is irrational and therefore violates the APA and NEPA.

Similarly, BOEM reasons that seafloor disturbance would result in a negligible increase in overall impacts on archaeological and historic resources partly because the disturbance would take place away from other, cumulative actions in state waters.[187] That reasoning defies logic: the effects on archaeological and historic resources, as a set, should be greater when activities are more extensive. The agency should clarify or revise its analysis on this point to comply with statutory requirements.

The Draft EIS also fails to take a "hard look" at the potential effects of an oil spill on certain species. For example, the oil spill response analysis does not examine specific areas important to fishes "because fish and fish larvae are ubiquitous throughout the open water habitat."[188] Likewise, it observes that a very large oil spill could harm the Western Distinct Population Segment of the Steller sea lion by reducing prey biomass and quality, yet it does not estimate the extent or likelihood of this harm.[189] Analytical omissions such as these render the Draft EIS inadequate.

[182] *See* Draft EIS at 4-84, 4-85; *see also id.* at 4-102 (noting that beluga whales have a "small area of avoidance with other oil and gas activities"); *id.* (citing a study that concluded that "beluga whales have likely habituated to offshore oil and gas activities in central Cook Inlet"); *id.* at 4-106 (concluding that activities will have negligible effects on harbor porpoises that approach them out of curiosity).
[183] *See, e.g.*, R. M. Rolland *et al.*, *Evidence That Ship Noise Increases Stress in Right Whales*, 279 PROC. ROYAL SOC'Y B 2363, 2364 (2012).
[184] Draft EIS at 4-110.
[185] *See, e.g.*, *id.* at 4-101 (beluga whales); *id.* at 4-104 (orcas); *id.* at 4-110, 4-111 (humpback whales).
[186] *See supra* n. 111.
[187] *See* Draft EIS at 5-74.
[188] *See id.* at 4-69.
[189] *See id.* at 4-285. Future biological opinions prepared under the Endangered Species Act may contain this information, but BOEM must disclose it during the NEPA process as well.

On several occasions, the Draft EIS simply does not provide enough explanation to inform the reader how the agency arrived at its impact conclusions. For instance, it states that "[f]acilities would not be sited and operations would not occur where they could obstruct navigable waters or areas of particular recreational value"—without specifying what those areas are or how the agency would guarantee that they would be protected.[190] Relatedly, the Draft EIS concludes that only onshore pipelines would "detract from the overall viewer experience," apparently overlooking platforms.[191] BOEM should expand upon these points to allow the public to evaluate the full impacts of the proposed action on recreation.

Regarding impacts on public health and communities, the Draft EIS notes that air pollution could increase the incidences of respiratory and cardiovascular diseases but does not provide quantitative estimates of those effects.[192] It similarly observes that oil spills can cause respiratory, endocrine, immunological, and genotoxic effects but does not indicate how widespread those harms would be if a large oil spill happened.[193] More broadly, BOEM expects that a large oil spill would disproportionately affect environmental justice communities "because these communities are more dependent on wild food production and distribution than the non-environmental justice communities in the proposed Lease Sale Area."[194] According to CEQ guidance, however, the agency should also consider the fact that most communities within the project area are environmental justice communities, and it should develop alternatives that might avoid or reduce impacts on these communities.[195]

For all these reasons, the Draft EIS does not meet NEPA's requirement that it take a "hard look" at the potential consequences of the proposed action, and it violates the APA's standards of reasoned decision-making.

X. BOEM DOES NOT SUFFICIENTLY ANALYZE THE CUMULATIVE AND INDIRECT EFFECTS OF THE PROPOSED ACTION

As discussed above in the context of climate change, NEPA requires agencies to discuss cumulative impacts, i.e., "the incremental impact[s] of the action when added to other past, present, and reasonably foreseeable future actions."[196] "Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."[197]

[190] *Id.* at 4-205.
[191] *See id.* at 5-67 to 5-68.
[192] *See id.* at 4-199.
[193] *Id.* at 4-201.
[194] *Id.* at 4-228.
[195] *See* Council on Environmental Quality, Environmental Justice: Guidance Under the National Environmental Policy Act at 15 (1997) ("When the agency has identified a disproportionately high and adverse human health or environmental effect on low-income populations, minority populations, or Indian tribes from either the proposed action or alternatives, the distribution as well as the magnitude of the disproportionate impacts in these communities should be a factor in determining the environmentally preferable alternative.").
[196] 40 C.F.R. § 1508.7.
[197] *Id.*

Agencies must also analyze indirect effects, which are those that are "caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable."[198] BOEM's treatment of cumulative and indirect effects is deficient in several respects.

The Draft EIS disregards the cumulative effects of alternatives other than the proposed action "because all of the action alternatives are presumed to entail the same amount of oil and gas activity."[199] That analytical shortcut prevents a comparison of the full impacts of the various alternatives proposed.[200] (Moreover, if all of the alternatives in fact involve the same level of oil and gas activity, then the agency has not presented a reasonable range of alternatives from which to choose.[201]) BOEM similarly treats the Cook Inlet lease sale that may be scheduled for 2021 as having the same effects as the proposed action,[202] even though the later lease sale's effects would extend further into the future and potentially cause greater harm as the region continues to warm and ecosystems struggle to adapt. The agency's choice not to analyze the cumulative effects of the lease sale together with those of other actions violates NEPA.

Finally, BOEM fails to consider increased vessel traffic outside the action area that might result from greater economic activity in the action area—even if most of the infrastructure and services can be provided locally and the oil and gas produced would be used in Alaska.[203] Vessel strikes, especially of North Pacific right whales, might be a concern if oceangoing vessel traffic were to increase.[204] The agency must remedy this defect before holding a lease sale.

[198] *Id.* § 1508.8(b).
[199] *See* Draft EIS at 5-1.
[200] *Cf. Sierra Forest Legacy v. Sherman*, 646 F.3d 1161, 1183 (9th Cir. 2011) ("To comply with a NEPA alternatives analysis, [an agency] must consider . . . the cumulative impacts of the proposed action." (internal quotation marks and citation omitted)).
[201] *Cf. Se. Alaska Conservation Council v. Fed. Highway Admin.*, 649 F.3d 1050, 1057 (9th Cir. 2011) (noting that, to satisfy NEPA, an EIS must "adequately examine[] a range of viable alternatives" (internal quotation marks and citation omitted)).
[202] *See* Draft EIS at 5-3.
[203] *See id.* at 4-87.
[204] *See* Draft EIS at 3-58; *see also* National Marine Fisheries Service, Final Recovery Plan for the North Pacific Right Whale (*Eubalaena japonica*) at I-19 (2013) (concluding that the severity of the threat of ship strikes to North Pacific right whales is "unknown but potentially high for the eastern population").

* * * * *

In conclusion, the Draft EIS ignores the context of climate change in which the Cook Inlet lease sale decision is to be made, and it fails adequately to assess the effects of the proposed action on climate change and other environmental impacts. BOEM must conduct a more thorough analysis and fully disclose the results to the public. We believe a full assessment of the climate and other effects and risks of the lease sale will lead to the conclusion that the sale should be canceled. Oil and gas produced from the sale would likely be unburnable in a future in which we meet our commitments to limit climate change. BOEM should cancel Cook Inlet lease sale 244.

Respectfully,

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SIERRA CLUB ALASKA CHAPTER

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PUBLIC SUBMISSION

As of: September 07, 2016
Received: September 06, 2016
Status: Posted
Posted: September 06, 2016
Tracking No. 1k0-8rrc-nbx9
Comments Due: September 06, 2016
Submission Type: Web

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0083
Comment from Bob Shavelson, Cook Inletkeeper

Submitter Information

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Organization: Cook Inletkeeper

General Comment

286 Alaskans opposed to more oil and leasing in Lower Cook Inlet, and supporting renewable energy development on Alaska's Outer Continental Shelf.

Attachments

Inletkeeper Lease Sale 244 Petition Comments 20160906

20 pages of a petition originally included in this submission have been omitted from this printed document, as they contained personal phone numbers and email addresses of the 286 petition signers. The text of the petition read:

A Petition Opposing New Fossil Fuel Leasing in Lower Cook Inlet

The undersigned do hereby oppose Lease Sale 244 because our marine resources and the fishing and tourism economics they support are incompatible with additional oil and gas development; climate change and ocean acidification are among the most pressing issues facing our people and our state, and we cannot afford to continue to develop new hydrocarbon sources; and BOEM has ignored its congressional mandate to promote the world-class renewable energy resources in and around Cook Inlet. As a result, BOEM should save taxpayer dollars by cancelling the lease sale, and pursue offshore renewable energy development as required by law.

PUBLIC SUBMISSION

As of: September 07, 2016
Received: September 06, 2016
Status: Posted
Posted: September 06, 2016
Tracking No. 1k0-8rrc-lt6c
Comments Due: September 06, 2016
Submission Type: Web

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0085
Comment from Bob Shavelson, Cook Inletkeeper

Submitter Information

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Cook Inletkeeper
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Homer, AK, 99603
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Phone: 9072354068
Fax: 9072354068
Organization: Cook Inletkeeper

General Comment

Comments from more than 380 Alaskans supporting renewable energy and opposed to Lease Sale 244

Attachments

Inletkeeper - BOEM 20160906

September 6, 2016

An Open Letter to Dr. Ross-Hopper to Cancel Oil & Gas Lease Sale 244, and Pursue the World-Class Renewable Energy Resources on Alaska's Outer Continental Shelf

Please don't waste more taxpayer time and money with Lease Sale 244. Our marine resources and the sustainable fishing and tourism jobs they support are incompatible with the industrialization new leases would bring to Lower Cook Inlet.

Alaska is already reeling from the effects of rapid climate change, and BOEM is not fulfilling its congressional mandate to bring Cook Inlet's world-class renewable energy resources online.

Please do the right thing: cancel Lease Sale 244 and pursue renewable power on Alaska's Outer Continental Shelf.

Sincerely,

400 (Mostly) Alaskan Petition Signers:

First Name	Last Name	City	State	Postal Code
1. John	Breiby	Wasilla	AK	99654
2. Duane	Howe	Homer	AK	99603
3. David	Story	Cooper Landing	AK	99572
4. Elizabeth	Blankenship	Anchorage	AK	99501
5. Deirdre	Coval	Soldotna	AK	99669
6. Cheryl	Lovegreen	Anchorage	AK	99516
7. carey K	Curtis	Homer	AK	99603
8. Robin	Brower	Boulder	CO	80302
9. G.	Fries	Homer	AK	99603
10. Marcia	Denison	Anchorage	AK	99501
11. Kevin	Hughes	Anacortes	WA	98221
12. Andrew	Clarke	Gig Harbor	WA	98332
13. Dale	Banks	Homer	AK	99603
14. Laura	Baldwin	Anchorage	AK	99501
15. Carlton	Russell	Anchorage	AK	99508
16. Andrew	Wills	Homer	AK	99603
17. Susan	Rennolds	Homer	AK	99603
18. Amy	Christiansen RN	Homer	AK	99603
19. DevDharm	Khalsa	Fairbanks	AK	99709
20. James	Gorman	Anchor point	AK	99556
21. Lisa	Scott	Fargo	ND	58104
22. Dave	Nuetzel	Sitka	AK	99835
23. Tricia	Caron	Homer	AK	99603
24. Donna	Beran	Homer	AK	99603
25. Shelley	Rainwater	Homer	AK	99603

26. August	Multz-Matthews	Homer	AK	99603
27. Jessica	Matthews	Central point	OR	97502
28. Ruth	Alvarez	Homer	AK	99603
29. Georgeanna	Heaverley	Fairbanks	AK	99709
30. Alysia	Loughlin-Bushey	Wasilla	AK	99654
31. Stanley	Kaneshiro	Kenai	AK	99611
32. Lauri	Pepi	Kasilof	AK	99610
33. Tom	Early	Homer	AK	99603
34. Kathleen	Shoop	Palmer	AK	99645
35. Scott	Miller	Homer	AK	99603
36. Carolyn	Sayre	Talkeetna	AK	99676
37. Michael	Jefferies	Anchorage	AK	99516
38. Warren	Keogh	Chickaloon	AK	99674
39. Kathleen	Irwin	Homer	AK	99603
40. Kathy	Sarns	Homer	AK	99603
41. candy	rohrer	Homer	AK	99603
42. Bonnie	Dupree	Homer	AK	99603
43. Steve	Turner	Anchorage	AK	99509
44. Steve	Turner	Anchorage	AK	99509
45. Susan	Vogt	Fairbanks	AK	99712
46. Michele	Cornelius	Haines	AK	99827
47. Melisse	Reichman	Homer	AK	99603
48. Patricia	Anderson	Anchorage	AK	99507
49. Angie	Hamill	Chugiak	AK	99567
50. Harold	Spence	Homer	AK	99603
51. Nancy	Hillstrand	Homer	AK	99603
52. Wayne	Jenkins	Homer	AK	99603
53. Gerald	Grappi	Homer	AK	99603
54. Marjorie	Belieu	Homer	AK	99603
55. Nancy	Cuddeback	Anchorage	AK	99507
56. Brenda	Trefon	Sterling	AK	99672
57. Colin	Mcgovern	Homer	AK	99603
58. Shelley	Gill	Homer	AK	99603
59. Bob	Shavelson	Homer	AK	99603
60. Robert	Winckler	Wasilla	AK	99687
61. Deborah	Poore	Homer	AK	99603
62. Dora	Coen	Homer	AK	99603
63. Dee	Hunt	Chugiak	AK	99567
64. Maureen	Powers	Homer	AK	99603
65. Lynn	Wilbur	Sitka	AK	99835
66. Laura	Bartholomae	Anchorage	AK	99517
67. John	Lancaster	Homer	AK	99603
68. Jenny	Weis	Anchorage	AK	99508
69. Carol	Kasza	Fairbanks	AK	99707
70. Susan	Pacilli	Anchorage	AK	99511
71. Louis	Dupree	Homer	AK	99603
72. Benay	Eagan	Anchor Point	AK	99556
73. Maureen	Knutsen	Naknek	AK	99633
74. Mike	Stoltz	Talkeetna	AK	99676

75. JoeRay	Skrha	Kenai	AK	99611
76. Mark	Lovegreen	Anchorage	AK	99516
77. John	Dodge	Homer	AK	99603
78. Mako	Haggerty	Homer	AK	99603
79. Carolyn	Nickles	Anchorage	AK	99507
80. Chris	Jacobson	Homer	AK	99603
81. Warren	Jones	Anchorage	AK	99508
82. Julie	Castle	Anchorage	AK	99516
83. James	McGrath	Homer	AK	99603
84. Brandon	Hill	Anchorage	AK	99503
85. KM	Dutton	Anchorage	AK	99501
86. Lynne	Hibdon	Homer	AK	99603
87. Laurie	Daniel	Homer	AK	99603
88. Bonnie	Nichols	Soldotna	AK	99669
89. Owen	Bettinge	Homer	AK	99603
90. Thomas	La Rose	Homer	AK	99603
91. Susan	Olsen	Anchorage	AK	99516
92. Nicole	Arevalo	Homer	AK	99603
93. Jeni	Stow	Homer	AK	99603
94. Sally	Gibbs	Anchorage	AK	99518
95. Stephanie	Horine	Anchorage	AK	99516
96. Mark	McArthur	Eagle River	AK	99577
97. Kerry	Mackin	Ipswich	MA	01938
98. Savanna	Paladino	Homer	AK	99603
99. Linda	Myers	Anchorage	AK	99518
100. Katie	Lund	St Paul	MN	55105
101. Treesa	Holland	Soldotna	AK	99669
102. Emily	Tiller	Palmer	AK	99645
103. L.	Millane	Seward	AK	99664
104. Mary	Wilson	Anchorage	AK	99518
105. Rob	Gibbs	Anchorage	AK	99518
106. Angela	Ferrari	Anchorage	AK	99517
107. Jill	Rife	Fritz Creek	AK	99603
108. Ariel	Brown	Homer	AK	99603
109. Amanda	Campbell	Homer	AK	99603
110. Maggie	Goedeke	Homer	AK	99603
111. Frani Scheffel	Scheffel	Homer	AK	99603
112. Joelle	Howald	Anchorage	AK	99502
113. Angela	Roland	Homer	AK	99603
114. vesta	burnett	Banner Elk	NC	28604
115. Eve	Baillargeon	Homer	AK	99603
116. Susan	Gill	Juneau	AK	99801
117. Kimberly	VanNostrand	Skagway	AK	99840
118. Gregory and Carole	Demers	Homer	AK	99603
119. Kristen	Cook	Homer	AK	99603
120. Mariah	Lumley	Fairbanks	AK	99710
121. Lindsay	Monty	Fairbanks	AK	99701
122. Pamela	Lipari	North Pole	AK	99705

123. Lynn	Palmquist	Anchorage	AK	99508
124. Bee	Long	Talkeetna	AK	99676
125. Mary	King	Soldotna	AK	99669
126. Amanda	Wells	Fairbanks	AK	99710
127. Megan	Griffith	New Orleans	LA	70117
128. Kristen	Schupp	Fairbanks	AK	98709
129. Denise	McAllister	Bellingham	WA	98225
130. Marina	Adickes	Anchor point	AK	99556
131. Linda	Caswell	Soldotna	AK	99669
132. Bradley	Kloeckl	Homer	AK	99603
133. Amy	Sassenberg	Carnation	WA	98014
134. Neal	Fallen	carnation	WA	98014
135. Jamie	Hodges	Chicago	IL	60641
136. Steven	Bergt	Anchorage	AK	99517
137. Brittney	Powell	Anchorage	AK	99504
138. Sheila	Graham	Kenai	AK	99611
139. Joshua	Razor	Ewa beach	HI	96706
140. Tamara	Branson	Homer	AK	99603
141. Irene	Nelson	Sterling	AK	99672
142. yuri	hobik	McKinney	TX	75070
143. Sheri	Thomson	Palmer	AK	99645
144. David	Snider	Eagle River	AK	99577
145. Tamara	Thomas	Homer	AK	99603
146. Kylie	McShane	Homer	AK	99603
147. Kim	Powell	Homer	AK	99603
148. Jessica	Moore	Soldotna	AK	99669
149. Catherine	Mcquigg	Eagle River	AK	99577
150. Jane	Lloyd	Homer	AK	99603
151. Bruce	Lloyd	Homer	AK	99603
152. Penny	Puhak	Kodiak	AK	99615
153. Michael	Schuster	Ninilchik	AK	99639
154. Leah	Scott	Anchor Point	AK	99556
155. Bill	Scott	Anchor Point	AK	99556
156. Joel	Isaak	Soldotna	AK	99669
157. Patricia	Rosnel	Palmer	AK	99645
158. Duncan	Wanamaker	Homer	AK	99603
159. darlene	coyle	Kasilof	AK	99610
160. John	Munns	Homer	AK	99603
161. Ember	Jackinsky	Anchorage	AK	99508
162. Laura	Brooks	Homer	AK	99603
163. Valerie	luczak	Wasilla	AK	99654
164. Ingrid	Johnson	Delta Junction	AK	99737
165. Deb	Moseley	Homer	AK	99603
166. Michele	Vasquez	Kenai	AK	99611
167. Suzanne	Walsh	Anchorage	AK	99508
168. Barbara	Johnson	Soldotna	AK	99669
169. Ancel	Johnson	Soldotna	AK	99669
170. Amrit	Kaur	Lynden	WA	98264

171.	Kimberly	Giroux	Anchorage	AK	99504
172.	Tracy	Harlow-Cummings	Anchor Point	AK	99635
173.	Julie	Rabeau	Anchorage	AK	99516
174.	Kira	Olsen	Homer	AK	99603
175.	Allison	Davis	Henderson	NV	89012
176.	Mark	Easton	Twisp	WA	98856
177.	Peg	Jacobson	Logandale	NV	89021
178.	Richard	Hatch	Anchor Point	AK	99556
179.	USA SSgt Ret Lawrence	Simmons	Soldotna	AK	99669
180.	Deven	Barnett	Fairbanks	AK	99709
181.	Deborah	Ives	Ninilchik	AK	99639
182.	shaorn	whytal	Homer	AK	99603
183.	Ira	Rosnel	Palmer	AK	99645
184.	Rebekah	Theriot	Homer	AK	99603
185.	Ken	Landfield	Homer	AK	99603
186.	Shay	Lowney	Homer	AK	99603
187.	Debra	Lowney	Homer	AK	99603
188.	Elvira	Paschke	Anchorage	AK	99508
189.	Mark	Gutman	Talkeetna	AK	99676
190.	Sandra	Stein	Anchorage	AK	99507
191.	Kim	Neill	Palmer	AK	99645
192.	Troy	Hines	Ninilchik	AK	99639
193.	Risa	Jackinsky	Homer	AK	99603
194.	Kat	Haber	Homer	AK	99603
195.	Sabine	Simmons	Homer	AK	99603
196.	Jenny	Yingling	Auburn	WA	98002
197.	Susan	Anderson	Hope	AK	99605
198.	Joanna	Greene	Homer	AK	99603
199.	Maria	Horn-Rollins	Anchorage	AK	99502
200.	Nicholas	Horn-Rollins	Anchorage	AK	99502
201.	Thomas	Soltis	Hurley	WI	54534
202.	Roger	Register	Houston	AK	99694
203.	Elizabeth	Suttle	Homer	AK	99603
204.	Josh	Klauder	Talkeetna	AK	99676
205.	Lacey	Harris	Wasilla	AK	99623
206.	joshua	tobin	Anchorage	AK	99501
207.	Jennifer	Poulin	Jacksonville	FL	32210
208.	Kari	Brooks	Wasilla	AK	99687
209.	Karianna	Derr	Homer	AK	99603
210.	Scott	Simmons	Homer	AK	99603
211.	Rochelle	De Forrest	Ashland	OR	97520
212.	Guinevere	Boyd	Willow	AK	99688
213.	Sue	Christiansen	Seldovia	AK	99663
214.	Dawn	Webster	Wasilla	AK	99623
215.	Jennifer	Wagner	Anchorage	AK	99507
216.	Suki	Knight	Greensboro	NC	27407
217.	Rita	Eagle	Anchorage	AK	99508
218.	Mike	Belitz	Sitka	AK	99835

219.	Heather	Rudisill	Anchorage	AK	99504
220.	Ruth	Sheridan	Anchorage	AK	99508
221.	Kenneth	Stahlhut	Anchorage	AK	99508
222.	Leah	Cloud	Homer	AK	99603
223.	Kevin	Walker	Homer	AK	99603
224.	Eric	Zuber	Sterling	AK	99672
225.	Sara	Petty	Anchorage	AK	99517
226.	Leif	Knutsen	Port Townsend	WA	98368
227.	Melanie	Reynolds	Anchor point	AK	99556
228.	Victor	Buncak	Homer	AK	99603
229.	kelly	jackman	homer	AK	99603
230.	Deborah	Limacher	Homer	AK	99603
231.	Kate	Sandberg	Girdwood	AK	99587
232.	Michael	McCurdy	Homer	AK	99603
233.	Kathryn	Crowley	Homer	AK	99603
234.	Kristina	Sunyata	Anchorage	AK	99593
235.	Carla	Stacy	Kenai	AK	99611
236.	Heather	Forbes	Homer	AK	99603
237.	Jamie	McCloud	homer	AK	99603
238.	Grete	Perkins	Talkeetna	AK	99676
239.	Christina	Peterson	Fairbanks	AK	99708
240.	Julie	Yates	Anchorage	AK	99501
241.	Jay	Cherok	Homer	AK	99603
242.	Brian	Miller	Homer	AK	99603
243.	Esau	Sinnok	Shishmaref	AK	99772
244.	Terri	Leman	Ninilchik	AK	99639
245.	Sage	Cohen	Anchorage	AK	99501
246.	Jason	Land	Salcha	AK	99714
247.	David	Nordeen	Ninilchik	AK	99639
248.	Jenny	Yingling	Auburn	WA	98002
249.	Kathleen	kennedy	Ninilchik	AK	99639
250.	Christina	Castellanos	Homer	AK	99603
251.	Jon	Ross	Kasilof	AK	99610
252.	Margaret	Quarton	Homer	AK	99603
253.	Janet	Bowen	Homer	AK	99603
254.	Dorothy	Sherwood	Homer	AK	99603
255.	Rachelle	Dowdy	Anchorage	AK	99518
256.	Cheryl	Silcox	Anchorage	AK	99517
257.	Angelika	Lynch	Anchorage	AK	99511
258.	Jennifer	Harmon	Anchorage	AK	99508
259.	Aeron	Henderson	Cowiche	WA	98923
260.	Allison	Gaylord	Homer	AK	99603
261.	mike	reidell	Anchorage	AK	99508
262.	Barbara	Tullis	Anchorage	AK	99516
263.	Brian	Okonek	Talkeetna	AK	99676
264.	Sharon	Baur	Homer	AK	99603
265.	William	Easton	Homer	AK	99603
266.	Clair Gordon	Terpening	Homer	AK	99603

267.	Ken	Marsh	Trapper Creek	AK	99683
268.	Bruce	White	Sitka	AK	99835
269.	martin	niemi	Douglas	AK	99824
270.	Jeanette	Hanneman	Big Lake	AK	99652
271.	barbara	kennedy	Homer	AK	99603
272.	Toby	Wheeler	Homer	AK	99603
273.	David	Athons	Soldotna	AK	99669
274.	Carol	Fritz	Big Lake	AK	99652
275.	Russell	Mumm	Homer	AK	99603
276.	Beverly	Short	Anchorage	AK	99516
277.	Judith	Donegan	Palmer	AK	99645
278.	Robert	McCard	Kasilof	AK	99610
279.	Pamela	Hays	Kasilof	AK	99610
280.	Seth	Yerrington	Anchorage	AK	99508
281.	John	Ippolito	Eagle River	AK	99577
282.	Pamela	Miller	Anchorage	AK	99508
283.	Shelley	Irons	Anchorage	AK	99518
284.	Paula	Williams	Anchorage	AK	99502
285.	George	Matz	Fritz Creek	AK	99603
286.	Bill	Sherwonit	Anchorage	AK	99517
287.	Douglas	Wedtphal	Homer	AK	99603
288.	Mark	Luttrell	Seward	AK	99664
289.	Louise	Ashmun	Homer	AK	99603
290.	James	Sweeney	Hope	AK	99605
291.	Malcolm	Gaylord	Homer	AK	99603
292.	John	Thibodeau	Kenai	AK	99611
293.	Dave	Brann	Homer	AK	99603
294.	Araceli	Mayers	Anchorage	AK	99508
295.	Tara	Walker	Anchorage	AK	99504
296.	Sharon	Waisanen	Soldotna	AK	99669
297.	De	Patch	Homer	AK	99603
298.	Carolyn	Hans	Anchorage	AK	99516
299.	Michelle	Edwards	Anchorage	AK	99516
300.	Michael	Wilson	Wasilla	AK	99654
301.	Marie	Pedraza	Palmer	AK	99645
302.	Robert	Archibald	Homer	AK	99603
303.	Roberta	Highland	Homer	AK	99603
304.	Amy	Pascucci	Soldotna	AK	99669
305.	Anne	Hurley	Anchorage	AK	99508
306.	John	Polonowski	Anchorage	AK	99517
307.	Harry	Post	Anchorage	AK	99504
308.	Brittany	Quales	Anchorage	AK	99504
309.	Brita	Mjos	Anchorage	AK	99508
310.	Audrey	Elicerio	Fairbanks	AK	99712
311.	Rochelle	Harrison	King Salmon	AK	99613
312.	Jeremiah	Maxwell	Anchorage	AK	99517
313.	Barbara	Hood	Anchorage	AK	99507
314.	Pamela	Minkemann	Anchorage	AK	99515

315.	Thomas	Ely	Haines	AK	99827
316.	Virginia	Hudson	Anchorage	AK	99510
317.	Detricia	Hahn	Anchor Point	AK	99556
318.	David	Sipos	Anchorage	AK	99508
319.	Kaitlin	Vadla	Soldotna	AK	99669
320.	Robert	Sylvester	Juneau	AK	99802
321.	Shannon	Mcbride-morin	Homer	AK	99603
322.	Angela	Harris	Anchorage	AK	99509
323.	wayne c	jones	palmer	AK	99645
324.	Martha	Siebe	Anchorage	AK	99507
325.	Rita	Campbell	Homer	AK	99603
326.	Elizabeth	Roderick	Anchorage	AK	99508
327.	Francis	Mogan	Nikiski	AK	99635
328.	Sarah	Hitchcock	Palmer	AK	99645
329.	Denis	Ransy	Talkeetna	AK	99676
330.	Joel	Cooper	Homer	AK	99603
331.	Fp	Romick	Anchorage	AK	99501
332.	Chelsea	Toma	Anchorage	AK	99503
333.	Ieremia	Toma	Anchorage	AK	99503
334.	Chad	Parker	Anchor point	AK	99556
335.	Julie K	Wahl	Anchorage	AK	99508
336.	Pete	Wedin	Homer	AK	99603
337.	Robert	Howard	Palmer	AK	99645
338.	Dave	Bachrach	Homer	AK	99603
339.	Elizabeth	Brandt	Anchorage	AK	99517
340.	Emily	Haas	Anchorage	AK	99524
341.	andre	ciostek	Palmer	AK	99645
342.	Kammi	Matson	Homer	AK	99603
343.	Byron	McCord	Seldovia	AK	99663
344.	Michaela	Baumgartner	Homer	AK	99603
345.	Trish	Herrmann	Homer	AK	99603
346.	Lorraine	Krueger	Eagle River	AK	99577
347.	Jennifer	Edwards	Homer	AK	99603
348.	Heidi	Renner	Kasilof	AK	99610
349.	Emily	Lints	Homer	AK	99603
350.	Tarika	Lea	Fairbanks	AK	99708
351.	Shoshana	Wilhite	Homer	AK	99603
352.	Konrad	Schaad	Homer	AK	99603
353.	Deborah	Vandruff	Anchorage	AK	99508
354.	Lisa	Moreno	Anchorage	AK	99504
355.	Diane	Wessing	Anchorage	AK	99515
356.	Jessica	Tenhoff	Homer	AK	99603
357.	Adele	Person	Homer	AK	99603
358.	Dean	Sundmark	Homer	AK	99603
359.	Marjorie	Ringer	Homer	AK	99603
360.	Dawn	Gandalf	Trout Creek	MT	59874
361.	Colin	Tolman	Homer	AK	99603
362.	Peggy	Paver	Homer	AK	99603
363.	Libby	Stortz	Sitka	AK	99835

364.	kimbrough	mauney	wasilla	AK	99654
365.	Sylvia	Maiellaro	Anchorage	AK	99511
366.	Barbara	Wyatt	Homer	AK	99603
367.	Sharon	McEntee	Sutton	AK	99674
368.	John	Bushell	Homer	AK	99603
369.	Brandy	Brandt	Homer	AK	99603
370.	Kristen	Tonga	Homer	AK	99603
371.	Jeff	Dean	Homer	AK	99603
372.	Catherine	Cassidy	Kasilof	AK	99610
373.	Erik	Huebsch	Kasilof	AK	99610
374.	Paula	Kulhanek	Homer	AK	99603
375.	Donald	Bridges	Kenai	AK	99611
376.	Cara	Flora	Bellingham	WA	98225
377.	Dulce	Ben-East	Wasilla	AK	99654
378.	John	Gaedeke	Fairbanks	AK	99709
379.	Cynthia	Maxwell	Anchorage	AK	99517
380.	Nancy	Lord	Homer	AK	99603
381.	Michael	McCurdy	Homer	AK	99603
382.	Rachael	Brennan	Homer	AK	99603
383.	Hannah	Heimbuch	Homer	AK	99603
384.	vern	jamison	mcminnville	OR	97128
385.	Tiffanae	Luke	Santa cruz	CA	95062
386.	Suraj	Holzwarth	Homer	AK	99603
387.	David	Duke	Homer	AK	99603
388.	Carly	Hitchner	Philadelphia	PA	19136
389.	Cody	Wise	Homer	AK	99603
390.	Julie	Davis	Homer	AK	99603
391.	Marga	Raskin	homer	AK	99603
392.	Georgie	Overturff	kenai	AK	99611
393.	Linda	Feiler	Anchor Point	AK	99556
394.	liz	Diament	Homer	AK	99603
395.	Will	Cook	Homer	AK	99603
396.	Cassie	Ricciardi	Homer	AK	99603
397.	Kat	Haber	Homer	AK	99603
398.	Robert	Vernon	Homer	AK	99603
399.	Gord	Vernon	Homer	AK	99603
400.	Kyle	Schneider	Homer	AK	99603

Representative of Submittals from Sierra Club | Document too voluminous to include in FEIS | All document reviewed and considered

PUBLIC SUBMISSION

As of: September 07, 2016
Received: September 06, 2016
Status: Posted
Posted: September 06, 2016
Tracking No. 1k0-8rrd-oonr
Comments Due: September 06, 2016
Submission Type: Unknown

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0086
2016_0906_Sierra_Club_Laura_Comer

Submitter Information

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Organization: Sierra Club

General Comment

See Attached

Attachments

2016_0906_Sierra_Club_Laura_Comer

Representative of Submittals from Sierra Club | Document too voluminous to include in FEIS | All document reviewed and considered

Abigail Ross Hopper, Director
Bureau of Ocean Energy Management
Alaska OCS Region
3801 Centerpoint Drive, Suite 500,
Anchorage, Alaska 99503-5823

Dear Director Hopper,

Drilling in Alaska is difficult and dangerous. Oil companies have enough fossil fuel reserves to last for decades. The industry knows this and their lack of interest has resulted in cancellation of previous auctions. Moving forward with BOEM's proposal to lease more than 1 million acres of Cook inlet so that oil and gas companies can drill makes no sense.

Alaska is already experiencing impacts of climate change in the form of melting glaciers and sea ice, sea level rise and ocean acidification. If we are to meet the global climate commitment we made in Paris, we must reject offshore drilling and leave dirty fuels in the ground. As we saw from the Deepwater Horizon disaster, offshore drilling puts our entire coastline at risk.

Additional drilling in these sensitive waters creates a risk of spills and pollution that would harm not only endangered Beluga whales but other wildlife such as sea otters, sea lions, salmon and cod. Alaskans depend on the jobs that fishing and tourism brings. Our wildlife are a key part of that.

We do not need the oil and we cannot afford another disaster at the hands of oil companies that put profit above our health, our communities, and our climate. Please choose the "No Action Alternative" for lease 244 and keep fossil fuels in the ground.

Sincerely,

Aishah Khalil
1340 Chance Ct
Anchorage, AK 99501

Representative of Submittals from Sierra Club | Document too voluminous to include in FEIS | All document reviewed and considered

Abigail Ross Hopper, Director
Bureau of Ocean Energy Management
Alaska OCS Region
3801 Centerpoint Drive, Suite 500,
Anchorage, Alaska 99503-5823

Dear Director Hopper,

I am writing as a concerned Alaskan.

Drilling in Alaska is difficult and dangerous. Oil companies have enough fossil fuel reserves to last for decades. The industry knows this and their lack of interest has resulted in cancellation of previous auctions. Moving forward with BOEM's proposal to lease more than 1 million acres of Cook Inlet so that oil and gas companies can drill makes no sense.

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We do not need the oil and we cannot afford another disaster at the hands of oil companies that put profit above our health, our communities, and our climate. Please choose the "No Action Alternative" for lease 244 and keep fossil fuels in the ground

Sincerely,

Ken Zafren
10181 Curvi St
Anchorage, AK 99507

Representative of Submittals from Sierra Club | Document too voluminous to include in FEIS | All document reviewed and considered

Abigail Ross Hopper, Director
Bureau of Ocean Energy Management
Alaska OCS Region
3801 Centerpoint Drive, Suite 500,
Anchorage, Alaska 99503-5823

Dear Director Hopper,

My husband & I used to live in Homer and want the Cook Inlet protected! Drilling in Alaska is difficult and dangerous. Oil companies have enough fossil fuel reserves to last for decades. The industry knows this and their lack of interest has resulted in cancellation of previous auctions. Moving forward with BOEM's proposal to lease more than 1 million acres of Cook Inlet so that oil and gas companies can drill makes no sense.

Alaska is already experiencing impacts of climate change in the form of melting glaciers and sea ice, sea level rise and ocean acidification. If we are to meet the global climate commitment we made in Paris, we must reject offshore drilling and leave dirty fuels in the ground. As we saw from the Deepwater Horizon disaster, offshore drilling puts our entire coastline at risk.

Additional drilling in these sensitive waters creates a risk of spills and pollution that would harm not only endangered Beluga whales but other wildlife such as sea otters, sea lions, salmon and cod. Alaskans depend on the jobs that fishing and tourism brings. Our wildlife are a key part of that.

We do not need the oil and we cannot afford another disaster at the hands of oil companies that put profit above our health, our communities, and our climate. Please choose the "No Action Alternative" for lease 244 and keep fossil fuels in the ground.

Sincerely,

Laurel Epps
8200 Northwood St
Anchorage, AK 99502

Representative of Submittals from Sierra Club | Document too voluminous to include in FEIS | All document reviewed and considered

Abigail Ross Hopper, Director
Bureau of Ocean Energy Management
Alaska OCS Region
3801 Centerpoint Drive, Suite 500,
Anchorage, Alaska 99503-5823

Dear Director Hopper,

This area is very fishing dependent and we don't want it trashed! Drilling in Alaska is difficult and dangerous. Oil companies have enough fossil fuel reserves to last for decades. The industry knows this and their lack of interest has resulted in cancellation of previous auctions. Moving forward with BOEM's proposal to lease more than 1 million acres of Cook Inlet so that oil and gas companies can drill makes no sense.

Alaska is already experiencing impacts of climate change in the form of melting glaciers and sea ice, sea level rise and ocean acidification. If we are to meet the global climate commitment we made in Paris, we must reject offshore drilling and leave dirty fuels in the ground. As we saw from the Deepwater Horizon disaster, offshore drilling puts our entire coastline at risk.

Additional drilling in these sensitive waters creates a risk of spills and pollution that would harm not only endangered Beluga whales but other wildlife such as sea otters, sea lions, salmon and cod. Alaskans depend on the jobs that fishing and tourism brings. Our wildlife are a key part of that.

We do not need the oil and we cannot afford another disaster at the hands of oil companies that put profit above our health, our communities, and our climate. Please choose the "No Action Alternative" for lease 244 and keep fossil fuels in the ground.

Sincerely,

Thomas Mader
PO Box 610
Cooper Landing, AK 99572

Representative of Submittals from Sierra Club | Document too voluminous to include in FEIS | All document reviewed and considered

Abigail Ross Hopper, Director
Bureau of Ocean Energy Management
Alaska OCS Region
3801 Centerpoint Drive, Suite 500,
Anchorage, Alaska 99503-5823

Dear Director Hopper,

Greetings,

Please do not grant any more leases for fossil fuel extraction in Alaskan waters. It is past time to keep all fossil fuels in the ground. As an Alaskan, I experience the costs to the environment and our people of our continued production and use of fossil fuels. The diminishing returns are not worth those costs. Please do everything you can to end this trade that is destroying our state.

Thank you.

Sincerely,

Nicholas Kwiek
PO Box 3268
Bethel, AK 99559

Representative of Submittals from Sierra Club | Document too voluminous to include in FEIS | All document reviewed and considered

Abigail Ross Hopper, Director
Bureau of Ocean Energy Management
Alaska OCS Region
3801 Centerpoint Drive, Suite 500,
Anchorage, Alaska 99503-5823

Dear Director Hopper,

I dont understand how we aren't waking up to the reality that oil and gas are not sustainable options environmentally AND economically! We need to be taking steps forward- not backwards! Invest in a future that we can sustain!

Drilling in Alaska is difficult and dangerous. Oil companies have enough fossil fuel reserves to last for decades. The industry knows this and their lack of interest has resulted in cancellation of previous auctions. Moving forward with BOEM's proposal to lease more than 1 million acres of Cook Inlet so that oil and gas companies can drill makes no sense.

Alaska is already experiencing impacts of climate change in the form of melting glaciers and sea ice, sea level rise and ocean acidification. If we are to meet the global climate commitment we made in Paris, we must reject offshore drilling and leave dirty fuels in the ground. As we saw from the Deepwater Horizon disaster, offshore drilling puts our entire coastline at risk.

Additional drilling in these sensitive waters creates a risk of spills and pollution that would harm not only endangered Beluga whales but other wildlife such as sea otters, sea lions, salmon and cod. Alaskans depend on the jobs that fishing and tourism brings. Our wildlife are a key part of that.

We do not need the oil and we cannot afford another disaster at the hands of oil companies that put profit above our health, our communities, and our climate. Please choose the "No Action Alternative" for lease 244 and keep fossil fuels in the ground.

Sincerely,

Su Chon
7531 Grey Wolf Cir
Anchorage, AK 99507

Representative of Submittals from Sierra Club | Document too voluminous to include in FEIS | All document reviewed and considered

Abigail Ross Hopper, Director
Bureau of Ocean Energy Management
Alaska OCS Region
3801 Centerpoint Drive, Suite 500,
Anchorage, Alaska 99503-5823

Dear Director Hopper,

I strongly believe that Alaska should look to and invest in the future which is renewable energy and energy efficiency. We most definitely need to protect the waters and lands that provide us with our most important renewable resources like salmon.

Drilling in Alaska is difficult and dangerous. Oil companies have enough fossil fuel reserves to last for decades. The industry knows this and their lack of interest has resulted in cancellation of previous auctions. Moving forward with BOEM's proposal to lease more than 1 million acres of Cook Inlet so that oil and gas companies can drill makes no sense.

Alaska is already experiencing impacts of climate change in the form of melting glaciers and sea ice, sea level rise and ocean acidification. If we are to meet the global climate commitment we made in Paris, we must reject offshore drilling and leave dirty fuels in the ground. As we saw from the Deepwater Horizon disaster, offshore drilling puts our entire coastline at risk.

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We do not need the oil and we cannot afford another disaster at the hands of oil companies that put profit above our health, our communities, and our climate. Please choose the "No Action Alternative" for lease 244 and keep fossil fuels in the ground.

Sincerely,

Maureen Knutsen
PO Box 134
Naknek, AK 99633

Representative of Submittals from Sierra Club | Document too voluminous to include in FEIS | All document reviewed and considered

Abigail Ross Hopper, Director
Bureau of Ocean Energy Management
Alaska OCS Region
3801 Centerpoint Drive, Suite 500,
Anchorage, Alaska 99503-5823

Dear Director Hopper,

There has been little to no interest in recent past lease sales in Cook Inlet, why are you pursuing any additional activity at this point? Drilling in Alaska is difficult and dangerous. Oil companies have enough fossil fuel reserves to last for decades. The industry knows this and their lack of interest has resulted in cancellation of previous auctions. Moving forward with BOEM's proposal to lease more than 1 million acres of Cook Inlet so that oil and gas companies can drill makes no sense.

Alaska is already experiencing impacts of climate change in the form of melting glaciers and sea ice, sea level rise and ocean acidification. If we are to meet the global climate commitment we made in Paris, we must reject offshore drilling and leave dirty fuels in the ground. As we saw from the Deepwater Horizon disaster, offshore drilling puts our entire coastline at risk.

Additional drilling in these sensitive waters creates a risk of spills and pollution that would harm not only endangered Beluga whales but other wildlife such as sea otters, sea lions, salmon and cod. Alaskans depend on the jobs that fishing and tourism brings. Our wildlife are a key part of that.

We do not need the oil and we cannot afford another disaster at the hands of oil companies that put profit above our health, our communities, and our climate. Please choose the "No Action Alternative" for lease 244 and keep fossil fuels in the ground.

Sincerely,

Laurie Daniel
PO Box 3713
Homer, AK 99603

Representative of Submittals from Sierra Club | Document too voluminous to include in FEIS | All document reviewed and considered

Abigail Ross Hopper, Director
Bureau of Ocean Energy Management
Alaska OCS Region
3801 Centerpoint Drive, Suite 500,
Anchorage, Alaska 99503-5823

Dear Director Hopper,

Drilling in Alaska is difficult and dangerous. Oil companies have enough fossil fuel reserves to last for decades. The industry knows this and their lack of interest has resulted in cancellation of previous auctions. Moving forward with BOEM's proposal to lease more than 1 million acres of Cook Inlet so that oil and gas companies can drill makes no sense. Let's turn this thinking around: water is more important than oil. We can't drink oil; it is not a source of life. Yet we have allowed our water sources to be polluted over and over by spills, leaks, melt downs. As climate change continues and with it, spreading drought, it is the planet's limited supply of water we should be protecting. More drilling is not only short-sighted, it is irrational. Let's stop.

Alaska is already experiencing impacts of climate change in the form of melting glaciers and sea ice, sea level rise and ocean acidification. If we are to meet the global climate commitment we made in Paris, we must reject offshore drilling and leave dirty fuels in the ground. As we saw from the Deepwater Horizon disaster, offshore drilling puts our entire coastline at risk.

Additional drilling in these sensitive waters creates a risk of spills and pollution that would harm not only endangered Beluga whales but other wildlife such as sea otters, sea lions, salmon and cod. Alaskans depend on the jobs that fishing and tourism brings. Our wildlife are a key part of that.

We do not need the oil and we cannot afford another disaster at the hands of oil companies that put profit above our health, our communities, and our climate. Please choose the "No Action Alternative" for lease 244 and keep fossil fuels in the ground.

Sincerely,

Linda Howe
66 Selwyn Rd.
Belmont, MA 02478

Representative of Submittals from Sierra Club | Document too voluminous to include in FEIS | All document reviewed and considered

Abigail Ross Hopper, Director
Bureau of Ocean Energy Management
Alaska OCS Region
3801 Centerpoint Drive, Suite 500,
Anchorage, Alaska 99503-5823

Dear Director Hopper,

I have just visited Cook Inlet. It deserves to be left as is. We all deserve that.

Drilling in Alaska is difficult and dangerous. Oil companies have enough fossil fuel reserves to last for decades. The industry knows this and their lack of interest has resulted in cancellation of previous auctions. Moving forward with BOEM's proposal to lease more than 1 million acres of Cook Inlet so that oil and gas companies can drill makes no sense.

Alaska is already experiencing impacts of climate change in the form of melting glaciers and sea ice, sea level rise and ocean acidification. If we are to meet the global climate commitment we made in Paris, we must reject offshore drilling and leave dirty fuels in the ground. As we saw from the Deepwater Horizon disaster, offshore drilling puts our entire coastline at risk.

Additional drilling in these sensitive waters just creates more risks of spills and pollution that would harm not only endangered Beluga whales but other wildlife such as sea otters, sea lions, salmon and cod. Alaskans depend on the jobs that fishing and tourism brings. Our wildlife are a key part of that. Enough damage has been done to the chain of nature already.

We do not need the oil and we cannot afford another disaster at the hands of oil companies that put profit above our health, our communities, and our climate. Please choose the "No Action Alternative" for lease 244 and keep fossil fuels in the ground.

Sincerely,

William Sharfman
50 Riverside Drive
New York, NY 10024

Respresentative of Submittals from Center for Biological Diversity | Document too voluminous to include in FEIS | All documents reviewed and considered

As of: September 07, 2016
Received: September 06, 2016
Status: Posted
Posted: September 07, 2016
Tracking No. 1k0-8rre-zi9d
Comments Due: September 06, 2016
Submission Type: Web

PUBLIC SUBMISSION

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0090
Comment from Kristen Monsell, Center for Biological Diversity

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Phone: 5108447137
Fax: 94612
Organization: Center for Biological Diversity

General Comment

Attached please find comments from the Center for Biological Diversity on BOEM's Draft EIS for Cook Inlet Lease Sale 244. Copies of the studies and other references cited in the comments are also attached.

Attachments

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Respresentative of Submittals from Center for Biological Diversity | Document too voluminous to include in FEIS | All documents reviewed and considered

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SYR_AR5_FINAL_full_wcover

0001_CBD Comments Cook Inlet LS 244 Draft EIS (9.6.16)

CENTER for BIOLOGICAL DIVERSITY Because life is good.

Via Regulations.gov and Electronic Mail

September 6, 2016

Abigail Hopper, Director
Bureau of Ocean Energy Management
1849 C Street, NW
Washington, DC 20240
Email: abigail.hopper@boem.gov

Caron McKee, Lease Sale 244 Environmental Coordinator
Alaska OCS Region
Bureau of Ocean Energy Management
3801 Centerpoint Drive, Suite 500
Anchorage, Alaska 99503
Email: caron.mckee@boem.gov

RE: Draft Environmental Impact Statement for the Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244; Docket No. BOEM-2014-0001

Dear Ms. Hopper and Ms. McKee:

The Center for Biological Diversity submits the following comments to the Bureau of Ocean Energy Management ("BOEM") on the Draft Environmental Impact Statement for Outer Continental Shelf Oil and Gas Lease Sale 244 in Cook Inlet ("Draft EIS").[1] BOEM's proposal to lease over 1 million acres of Cook Inlet so that oil and gas companies can drill an estimated 215 million barrels of oil and 571 billion cubic feet of natural gas billion over the next 40 years will deepen the climate crisis and reverse course on President Obama's commitment to combat climate change. We therefore urge BOEM to adopt the no-action alternative, cancel Lease Sale 244—the last lease sale under the 2012-2017 offshore oil and gas leasing plan—and halt all new oil and gas lease sales in federal waters.

BOEM's mandate under the Outer Continental Shelf Lands Act ("OCSLA") to ensure that offshore oil and gas development is balanced "with protection of the human, marine, and coastal environments," and that BOEM consider "national needs" in making decisions under OCSLA,[2] requires BOEM to limit the climate change effects of its actions. This is particularly true considering BOEM has already leased more than 20 million acres of offshore areas to oil

[1] 81 Fed. Reg. 47,819 (July 22, 2016).
[2] 43 U.S.C. §§ 1802(2); 1332(3).

Alaska . Arizona . California . Florida . Minnesota . Nevada . New Mexico . New York . Oregon . Vermont . Washington, DC
Kristen Monsell, Staff Attorney, Oceans Program . 1212 Broadway, Suite 800 . Oakland, CA 94612
Phone: 510-844-7100 x 337 . Fax: 510-844-7150 . kmonsell@biologicaldiversity.org

companies. Cancelling Lease Sale 244 and ending all future offshore oil and gas leases would prevent billions of tons of greenhouse gas pollution and limit the destructive effects associated with drilling for and burning oil and gas extracted from our oceans.

In addition to worsening the effects of climate change, BOEM's proposal will cause a wide variety of other threats to public health and the environment including oil spills that would be nearly impossible to clean up; harmful air and water pollution; and further negative impacts to already imperiled wildlife and local communities. Offshore oil and gas exploration, development, and production are inherently dangerous and it is time the administration transitioned the nation away from this toxic practice.

At the very least, BOEM must substantially revise its Draft EIS and reissue the document for public comment. BOEM's Draft EIS fails to adequately define the purpose and need of its proposal; and fails to take a "hard look" at the impacts of Lease Sale 244 by failing to quantify or analyze the impacts from consumption of the oil and gas to be extracted, failing to consider the impacts from offshore fracking and acidizing, failing to adequately consider impacts to species already struggling to survive, and inappropriately dismissing large and catastrophic oil spills as unlikely. The Draft EIS also fails to otherwise adequately consider cumulative impacts; fails to consider an adequate range of alternatives to Lease Sale 244; and fails to adequately consider environmental justice issues. In short, the Draft EIS is woefully inadequate and does not meet the legal requirements of the National Environmental Policy Act ("NEPA").

Further, BOEM cannot hold Lease Sale 244 unless and until formal consultation under Section 7 of the Endangered Species Act ("ESA") is completed. Holding Lease Sale 244 in absence of comprehensive, formal consultation would violate BOEM's substantive duty to ensure that its actions do not jeopardize the continued existence of imperiled species, such as the critically endangered Cook Inlet beluga whale. But the only way to truly protect these species, as well as local communities and our planet, is to adopt the no-action alternative and leave dirty fossil fuels in the ground.

I. BOEM's Purpose and Need Statement Fails to Comply with NEPA

BOEM's purpose and need statement fails to comply with NEPA. NEPA's implementing regulations provide that an EIS should "specify the underlying purpose and need to which the agency is responding in proposing the alternatives including the proposed action."[3] This purpose and need inquiry is crucial for a sufficient environmental analysis because "[t]he stated goal of a project necessarily dictates the range of 'reasonable' alternatives."[4] Thus, "an agency cannot define its objectives in unreasonably narrow terms" without violating NEPA.[5]

BOEM's stated purpose and need for its proposed action is "to offer certain OCS blocks located in Federal waters of Cook Inlet that may contain economically recoverable oil and gas resources" in order "to further the orderly development of OCS resources."[6] This purpose and

[3] 40 C.F.R. § 1502.13.
[4] *Carmel-by-the-Sea v. U.S. Dep't of Transp.*, 123 F.3d 1142, 1155 (9th Cir. 1997).
[5] *Id.*
[6] Draft EIS at ES-1; 1-3.

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need is too narrow and thus inadequate because BOEM necessarily considered an unreasonably narrow range of alternatives. By framing its purpose as auctioning off certain areas of the OCS that might contain recoverable oil and gas, BOEM necessarily makes auctioning off all of the OCS blocks offered in Cook Inlet Lease Sale 244 (i.e., the proposed alternative), the only way to meet such a need. But OCSLA charges the Bureau with ensuring that "environmental safeguards" are in place for offshore oil development and ensuring the "balance [of] orderly energy resource development *with protection of the human, marine, and coastal environments*" and "national needs."[7] Accordingly, BOEM should have focused its purpose and need inquiry on objectives that comport with these statutory duties, rather than on something that would only allow for more oil development.[8] This is particularly true considering that BOEM has already leased more than 20 million acres of the OCS to oil companies, and U.S. commitments to limit greenhouse gas emissions to help prevent the most catastrophic impacts of climate change.

Moreover, NEPA evaluation must take place "*before* decisions are made."[9] Such an approach ensures that agencies will take the requisite "hard look" at environmental consequences *before* approving any major federal action.[10] But BOEM's purpose and need statement indicates that it did just the opposite. In other words, the statement demonstrates that BOEM has already made the decision hold Lease Sale 244 as proposed and that its entire analysis was framed in a way to support that pre-determined outcome. BOEM's backward approach reflects a fundamental misunderstanding of its legal obligations and an apparent desire to appease the oil industry at the expense of our ocean environment and climate.

II. BOEM Failed To Take a Hard Look at the Direct, Indirect, and Cumulative Impacts of Greenhouse Gas Emissions and Climate Change

BOEM's Draft EIS acknowledges oil and gas developed pursuant to Lease Sale 244 would be consumed as fuel and produce greenhouse gas emissions that would contribute to climate change.[11] Yet BOEM wholly failed to consider the impacts of refining, transporting, and consuming the oil and gas developed under its leasing proposal. Moreover, while BOEM incorporates some analysis of climate change, that analysis is entirely cursory and fails to adequately describe baseline conditions or acknowledge how climate change will impact oil and gas infrastructure in the Cook Inlet. Such failures violate NEPA.

A. <u>BOEM's Draft EIS Arbitrarily Fails To Quantify or Analyze Downstream Greenhouse Gas Emissions</u>

BOEM's Draft EIS fails to quantify the greenhouse gas emissions that would be emitted by refining, transporting, and consuming the oil and gas to be extracted under its proposal; it also fails to consider the impacts of those greenhouse gas emissions. But NEPA requires such analysis.

[7] 43 U.S.C. §§ 1332(3), 1802(2)(B) (emphasis added); 1332(3).
[8] *See Citizens Against Burlington, Inc. v. Busey*, 938 F.2d 190, 196 (D.C. Cir. 1991).
[9] 40 C.F.R. § 1500.1(a) (emphasis added).
[10] *Kleppe v. Sierra Club*, 427 U.S. 390, 410, n. 21 (1976); *see also* 40 C.F.R. § 1502.5 (analysis must "not be used to rationalize or justify decisions already made").
[11] Draft EIS at 4-12.

In evaluating the environmental impacts of the proposed action, NEPA requires BOEM to consider and describe the direct and indirect impacts.[12] These impacts are distinct from one another. Direct effects are "caused by the action and occur at the same time and place."[13] Indirect effects are caused by the action but, "are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effect on air and water and other natural systems, including ecosystems."[14] Downstream and lifecycle greenhouse gas emissions are precisely the kind of indirect effects that BOEM must consider in analyzing the impacts of its leasing proposal.

Climate change, driven primarily by the combustion of fossil fuels, poses a severe and immediate threat to the health, welfare, ecosystems, and economy of the United States and the world. In recognition of these threats, the Paris Agreement—adopted by 197 countries, including the United States, on December 12, 2015—codifies the international, scientific consensus that climate change is an "*urgent and potentially irreversible threat to human societies and the planet* and thus requires the widest possible cooperation by all countries." [15] Accordingly, the Paris Agreement commits all signatories to an articulated target to hold the long-term global average temperature "to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels."[16] Immediate and aggressive greenhouse gas emissions reductions are necessary to keep warming below a 1.5º or 2°C rise above pre-industrial levels.

Put simply, there is only a finite amount of carbon dioxide ("CO_2") that can be released into the atmosphere without rendering the goal of meeting the 1.5°C (or even a 2°C) target virtually impossible. Globally, proven fossil fuel reserves, let alone additional recoverable resources,[17] if extracted and burned, would release enough CO_2 to exceed this limit several times over.[18] Consequently, the vast majority of fossil fuels must remain in the ground.

The physical question of what amount of fossil fuels can be extracted and burned without negating a realistic chance of meeting a 1.5°C or even 2ºC target is relatively easy to answer. The Fifth Assessment Report of the International Panel on Climate Change ("IPCC") and other expert assessments have established global carbon budgets, or the total amount of remaining carbon that can be burned while maintaining some probability of staying below a given temperature target. According to the IPCC, total cumulative anthropogenic emissions of CO_2 must remain below about 1,000 gigatons ("$GtCO_2$") from 2011 onward for a 66 percent

[12] 40 C.F.R §§ 1502.16, 1508.7, 1508.8; *Northern Plains Resource Council v. Surface Transportation Board*, 668 F.3d 1067, 1072-73 (9th Cir. 2011).
[13] 40 C.F.R. § 1508.8(a).
[14] *Id.* § 1508.8(b).
[15] Paris Agreement, Decision, Art. 4(3); Recitals.
[16] *Id.*, Art. 2 (emphasis added).
[17] *See* Whitney, Gene *et al.*, Cong. Research Serv., R40872, U.S. Fossil Fuel Resources: Terminology, Reporting and Summary 4-5 (2010).
[18] *See, e.g.*, IPCC, 2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change at 64 & Table 2.2 [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)] at 63-64 & Table 2.2. ("IPCC AR5 Synthesis Report").

probability of limiting warming to 2°C above pre-industrial levels.[19] The Paris Agreement aim of limiting the temperature increase to 1.5°C requires a more stringent carbon budget of only 400 $GtCO_2$ from 2011 onward (of which more than 100 $GtCO_2$ has already been emitted)[20] for a 66 percent probability of limiting warming to 1.5°C above pre-industrial levels.[21] Increasing the odds of meeting these targets requires meeting even stricter carbon budgets.[22] Given that global CO_2 emissions in 2014 alone totaled 36 $GtCO_2$,[23] humanity is rapidly consuming the remaining burnable carbon budget needed to have even a 66 percent chance of meeting the 1.5°C temperature limit.

Recent analysis shows that the potential emissions from all U.S. federal fossil fuel resources are between 349 and 492 $GtCO_2e$, with unleased fossil fuels comprising 91 percent of these potential emissions.[24] The OCS accounts for 64 percent of all unleased federal natural gas and 72 percent of all unleased federal oil, for an estimated total of between 52 and 62 $GtCO_2e$.[25] In other words, unleased federal fossil fuels, if extracted and burned, would consume between roughly 70 and 100 percent of a *global* budget of 450 $GtCO_2e$, the amount remaining at the start of 2016 under a budget scenario that itself has only a 66 percent chance of limiting temperature increase to 1.5°C.[26] Unleased OCS areas alone would consume between 11.6 percent and 13.8 percent of that *global* budget. Continued leasing of these fossil fuels is incompatible with any reasonable domestic and international path to limiting warming to 1.5°C or even 2°C.

Conversely, keeping fossil fuels in the ground by ending new offshore leases will help limit warming by reducing greenhouse gas emissions. For example, a recent report found that for each unit of oil that is not extracted from federal lands, net global consumption of oil and substitute fuels falls by 0.22 units by 2030, with a proportionate decrease in greenhouse gas emissions.[27] Accordingly, the report estimates that ending new offshore and onshore oil leases

[19] IPCC, 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change; Summary for Policymakers at 27 ("IPCC AR5 Physical Science Basis"); *see also* IPCC AR5 Synthesis Report at 63-64 & Table 2.2. Higher probabilities of success require stricter carbon limits; to have an 80% probability of staying below the 2°C target, the budget from 2000 is 890 GtCO2, with less than 430 GtCO2 remaining. *See* Meinshausen, M. *et al.*, Greenhouse gas emission targets for limiting global warming to 2 degrees Celsius, 458 Nature 1158–1162 (2009) ("Meinshausen *et al.* 2009") at 1159; Carbon Tracker Initiative, Unburnable Carbon – Are the world's financial markets carrying a carbon bubble? available at http://www.carbontracker.org/wp-content/uploads/2014/09/Unburnable-Carbon-Full-rev2-1.pdf.
[20] From 2012-2014, 107 GtCO2 was emitted (*see* Annual Global Carbon Emissions at http://co2now.org/Current-CO2/CO2-Now/global-carbon-emissions.html). Given additional emissions in 2015, the remaining carbon budget for 1.5°C would now be well below 300 GtCO2 (approximately 450 Gt CO2e).
[21] IPCC AR5 Synthesis Report at 64 & Table 2.2.
[22] *See* Meinshausen *et al.* at 1159; Carbon Tracker Initiative 2013, Unburnable Carbon.
[23] *See* Global Carbon Emissions, http://co2now.org/Current-CO2/CO2-Now/global-carbon-emissions html.
[24] *Id.* Using a metric of CO2e (which also includes the radiative or climate forcing potential of non-CO2 greenhouse gases such as methane), Mulvaney *et al.*'s study calculated that extraction and combustion of total U.S. fossil fuels would produce 697 to 1070 GtCO2e of emissions, with federal fossil fuels responsible for between 349 and 492 GtCO2e. The potential GHG emissions of unleased federal fossil fuel resources range from 319 to 450 492 GtCO2e.
[25] *Id.* at 18, 24-25 (offshore crude oil potential emissions of 27.65-31.50 GtCO2e, offshore natural gas potential emissions of 24.07-30.05 GtCO2e).
[26] *Id.*
[27] Erickson, Peter and Michael Lazarus, *How would phasing out U.S. federal leases for fossil fuel extraction affect CO2 emissions and 2°C goals?* Stockholm Environment Institute, Working Paper, 2016-02 (2016) at 24.

would lead to a net reduction of global CO_2 emissions from oil of 31 $MtCO_2$ in the year 2030.[28] And the reduction in greenhouse gas emissions would increase in the years after 2030.[29]

Yet BOEM fails to consider the impacts of the consumption of the oil and gas to be extracted under Lease Sale 244, claiming doing so would be "unduly speculative."[30] But NEPA plainly requires "reasonable forecasting," which includes the consideration of "reasonably foreseeable future actions. . . even if they are not specific proposals."[31] Full development of the areas for lease is entirely foreseeable in light of the E&D Scenario that specifically estimates the amount of oil and gas to be extracted. That BOEM cannot precisely calculate the exact total emissions is not a rational basis for not conducting such analysis. As courts have made perfectly clear, "[b]ecause speculation is . . . implicit in NEPA," agencies may not "shirk their responsibilities under NEPA by labeling any and all discussion of future environmental effects as crystal ball inquiry."[32]

Indeed, the final CEQ Guidance on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in NEPA provides clear direction for BOEM to conduct a lifecycle greenhouse gas analysis:

> If the direct and indirect GHG emissions can be quantified based on available information, including reasonable projections and assumptions, agencies should consider and disclose the reasonably foreseeable direct and indirect emissions when analyzing the direct and indirect effects of the proposed action. Agencies should disclose the information and any assumptions used in the analysis and explain any uncertainties. To compare a project's estimated direct and indirect emissions with GHG emissions from the no-action alternative, agencies should draw on existing, timely, objective, and authoritative analyses, such as those by the Energy Information Administration, the Federal Energy Management Program, or Office of Fossil Energy of the Department of Energy. In the absence of such analyses, agencies should use other available information.[33]

CEQ's guidance even provides an example of where a lifecycle analysis is appropriate in a leasing context: "The indirect effects of such an action that are reasonably foreseeable at the time would vary with the circumstances of the proposed action. For actions such as a Federal lease sale of coal for energy production, the impacts associated with the end-use of the fossil fuel being extracted would be the reasonably foreseeable combustion of that coal."[34]

Numerous greenhouse gas calculation tools exist to develop lifecycle analyses, particularly for fossil fuel extraction, operations, transport, and end-use emissions.[35] And the

[28] *Id.*at 25.
[29] *Id.*at 32.
[30] Draft EIS at 4-12.
[31] *N. Plains Res. Council, Inc. v. Surface Transp. Bd.*, 668 F.3d 1067, 1079 (9th Cir. 2011) (citation omitted).
[32] *Id.*
[33] 81 Fed. Reg. 51,866 (Aug. 5, 2016); Final Guidance at 16 (citations omitted).
[34] *Id.* at n. 42.
[35] *See* Council on Environmental Quality, Greenhouse Gas Accounting Tools, https://ceq.doe.gov/current_developments/GHG-accounting-tools.html.

Department of Energy has historically utilized these types of lifecycle emissions analyses in NEPA review of oil and gas infrastructure projects.[36]

BOEM's reasoning and its attendant failure to quantify and analyze the impacts of the lifecycle greenhouse gas emissions as a result of Lease Sale 244 is therefore improper. And because BOEM ignores the impacts of consuming the oil and gas to be extracted under its proposal, BOEM wholly fails to discuss how its proposal can possibly be consistent with the Paris Agreement and efforts to limit warming to 1.5°C or 2°C to avert the worst impacts of climate change. Such failures violate NEPA.

B. BOEM Failed To Analyze the Impacts of Climate Change on the Environment

In addition to failing to quantify and analyze the impacts from the greenhouse gas emissions that would result from refining, transporting, and consuming the oil and gas to be extracted under Lease Sale 244 pursuant to a lifecycle analysis, BOEM failed to adequately describe baseline conditions related to climate change or consider the impacts of climate change on the ocean environment.

While BOEM's analysis acknowledges that climate change is occurring, its analysis is cursory and fails to properly disclose the enormity of the problem, or the contribution of its proposal to the problem. For example, BOEM fails to adequately analyze the unique impacts of ocean acidification and black carbon emissions over the course of its proposal and its proposal's contribution to these significant environmental problems. BOEM also failed to adequately consider sea level rise, coastal erosion, and permafrost melt and the impacts of these effects on oil and gas infrastructure.

i. BOEM Failed To Adequately Analyze the Impacts of Ocean Acidification

Greenhouse gas pollution is causing the oceans to acidify at an alarming rate, with particularly profound impacts in waters off Alaska. The ocean's absorption of anthropogenic carbon dioxide is changing its chemistry, lowering its pH and causing ocean acidification.[37] Surface ocean pH has already dropped by about 0.1 pH units from 8.16 in 1800 to 8.05 today, resulting in a rise in surface ocean acidity of about thirty percent.[38] The pH of the ocean is currently changing rapidly at a rate 100 times anything seen in hundreds of millennia, and may drop by another 0.3 or 0.4 (resulting in a 100 – 150 percent increase in acidity) by the end of this

[36] *See e.g.*, U.S. Department of Energy National Energy Technology Laboratory, Life Cycle Greenhouse Gas Perspective on Exporting Liquefied Natural Gas from the United States, DOE/NETL-2014/1649 (May 29, 2014), available at http://energy.gov/sites/prod/files/2014/05/f16/Life%20Cycle%20GHG%20Perspective%20Report.pdf; U.S. Department of Energy National Renewable Energy Laboratory, Life Cycle Greenhouse Gas Emissions from Electricity Generation Fact Sheet, Pub No. NREL/FS-6A20-57817 (2013), available at http://www nrel.gov/docs/fy13osti/57187.pdf.
[37] Feely, R. A., S. C. Doney, and S. R. Cooley. 2009. Ocean acidification: present conditions and future changes in a high-CO_2 world. Oceanography 22:36-47.
[38] Orr, J. C., V. J. Fabry, O. Aumont, L. Bopp, S. C. Doney, R. A. Feely, A. Gnanadesikan, N. Gruber, A. Ishida, F. Joos, R. M. Key, K. Lindsay, E. Maier-Reimer, R. Matear, P. Monfray, A. Mouchet, R. G. Najjar, G. K. Plattner, K. B. Rodgers, C. L. Sabine, J. L. Sarmiento, R. Schlitzer, R. D. Slater, I. J. Totterdell, M. F. Weirig, Y. Yamanaka, and A. Yool. 2005. Anthropogenic ocean acidification over the twenty-first century and its impact on calcifying organisms. Nature 437:681-686.

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century.[39] If carbon dioxide emissions continue unabated, resulting changes in ocean acidity could exceed anything experienced in the past 300 million years.[40] Even if CO2 emissions stopped immediately, the ocean would continue to absorb the excess carbon dioxide in the atmosphere, resulting in further acidification until the planet's carbon budget returned to equilibrium.

A primary impact of ocean acidification is that it depletes seawater of the carbonate compounds—aragonite and calcite—that many marine creatures need to build shells and skeletons.[41] As a result, ocean acidification hinders organisms such as corals, crabs, seastars, sea urchins and plankton from building the protective armor they need to survive. Rising acidity also affects the basic functions of fish, squid, invertebrates, and other marine species, including detrimental effects on metabolism, respiration and photosynthesis, which can thwart their growth and lead to higher mortality.[42] Because of its serious impacts to so many species, ocean acidification threatens to disrupt the entire marine food web.

Rising acidification will also significantly increase ocean noise pollution. Scientists found that ocean acidification is reducing the absorption of low frequency sound important to marine mammals (~300 Hz–10 kHz), resulting in ever-increasing noise pollution in the oceans, and that significant changes in noise pollution will happen by mid-century.[43] With increasing ocean acidification, low-frequency sound travels much farther due to changes in the amounts of pH-dependent species such as dissolved borate and carbonate ions, which absorb acoustic waves. Under the pH change from a doubling of CO2, which is expected to happen in the surface ocean by mid-century, sound at frequencies important for marine mammals will travel some 70 percent farther.[44] Scientists have also found that increases in ocean temperature have the effect of decreasing sound absorption in the lower frequency range even more.[45]

Ocean acidification is affecting the Arctic most strongly.[46] Seasonal aragonite undersaturation is already occurring in many Arctic regions.[47] The Beaufort Sea shelf exhibits

[39] Meehl, G. A., T. F. Stocker, W. D. Collins, P. Friedlingstein, A. T. Gaye, J. M. Gregory, A. Kitoh, R. Knutti, J. M. Murphy, A. Noda, S. C. B. Raper, I. G. Watterson, A. J. Weaver, and Z.-C. Zhao. 2007. 2007: Global Climate Projections. in S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K. B. Averyt, M. Tignor, and G. H. Miller, editors. Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge University Press, Cambridge, UK, and New York, NY, USA.
[40] Caldeira, K., and M. E. Wickett. 2003. Anthropogenic carbon and ocean pH. Nature 425:365.
[41] Fabry, V. J., B. A. Seibel, R. A. Feely, and J. C. Orr. 2008. Impacts of ocean acidification on marine fauna and ecosystem processes. ICES Journal of Marine Sciences 65:414-432.
[42] *Id*.
[43] Brewer, P. G., and K. C. Hester. 2009. Ocean acidification and the increasing transparency of the ocean to low-frequency sound. Oceanography 22:86-93.
[44] *Id*.
[45] Hester, K. C., E. T. Peltzer, W. J. Kirkwood, and P. G. Brewer. 2008. Unanticipated consequences of ocean acidification: a noisier ocean at lower pH. Geophysical Research Letters 35, L19601, doi:10.1029/2008GL034913.
[46] Feely, R. A., S. C. Doney, and S. R. Cooley. 2009. Ocean acidification: present conditions and future changes in a high-CO_2 world. Oceanography 22:36-47.
[47] Yamamoto-Kawai, M., F. McLaughlin, E. C. Carmack, S. Nishino, and K. Shimada. 2009. Aragonite undersaturation in the Arctic Ocean: effects of ocean acidification and sea ice melt. Science 326:1098-1100; Azetsu-Scott, K., A. Clark, K. Falkner, H. Hamilton, E. P. Jones, C. Lee, B. Petrie, S. Prinsenberg, M. Starr, and P. Yeats.

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corrosive waters at least during some seasons. Undersaturated waters (i.e., corrosive waters) to calcium carbonate, where $\Omega_{aragonite}$ can be as low as 0.5 and $\Omega_{calcite}$ as low as 0.9, are already found seasonally in surface and bottom waters of the Chukchi Seas due to the a combination of respiration process and anthropogenic CO_2 uptake.[48] High primary productivity during summer months increases organic carbon that is remineralized back to CO_2 which increases pCO_2 and drives pH decline in subsurface waters.[49] Biological respiration during the summer months intensify these processes further lowering the pH and amplifying the impacts of ocean acidification.[50] The increasing loss of Arctic sea ice in the Beaufort Sea driven by anthropogenic climate change can facilitate upwelling process that brings CO2 rich water to the surface during fall and winter storms.[51] As Arctic sea ice continues to form later in the winter, the Beaufort shelf is likely to be persistently undersaturated with respect to aragonite.[52]

If current emissions trends continue, scientists predict that by 2050 all Arctic surface waters will be corrosive to organisms that use aragonite to build their shells, and that most of the Arctic will be corrosive to calcite-using organisms by 2095.[53] Declines and losses of these calcifying creatures would undoubtedly be disastrous for the Arctic food web. Because scientists can calculate CO2 contribution to chemistry changes, BOEM must quantify the lease sale's contribution to ocean acidification.

In addition, ocean acidification has the potential to profoundly affect the growth and toxicity of phytoplankton associated with harmful algae blooms ("HABs").[54] HABs can cause mortality in marine mammals through contamination of food sources. Some strains of phytoplankton in HABs produce copious amount of domoic acid, a kanic acid analog neurotoxin.[55] Exposure to this toxin via food sources can affect the brain, causing seizures,

2010. Calcium carbonate saturation states in the waters of the Canadian Arctic Archipelago and the Labrador Sea. Journal of Geophysical Research 115:C11021, doi:11010.11029/12009JC005917.
[48] Jeremy T. Mathis and Jennifer M. Questel, "Assessing Seasonal Changes in Carbonate Parameters across Small Spatial Gradients in the Northeastern Chukchi Sea," *Continental Shelf Research* 67, Seasonal and Interannual Dynamics of the Northeastern Chukchi Sea Ecosystem (September 2013): 42–51, doi:10.1016/j.csr.2013.04.041.
[49] N. R. Bates et al., "Summertime Calcium Carbonate Undersaturation in Shelf Waters of the Western Arctic Ocean – How Biological Processes Exacerbate the Impact of Ocean Acidification," *Biogeosciences* 10, no. 8 (August 2013): 5281–5309, doi:10.5194/bg-10-5281-2013.
[50] Mathis and Questel, "Assessing Seasonal Changes in Carbonate Parameters across Small Spatial Gradients in the Northeastern Chukchi Sea."
[51] Jeremy T. Mathis et al., "Storm-Induced Upwelling of High pCO2 Waters onto the Continental Shelf of the Western Arctic Ocean and Implications for Carbonate Mineral Saturation States," *Geophysical Research Letters* 39, no. 7 (April 2012): L07606, doi:10.1029/2012GL051574.
[52] N. Bednaršek et al., "Extensive Dissolution of Live Pteropods in the Southern Ocean," Nature Geoscience 5, no. 12 (November 25, 2012): 881–885, doi:10.1038/ngeo1635.
[53] Fabry, V. J., J. B. McClintock, J. T. Mathis, and J. M. Grebmeier. 2009. Ocean acidification at high latitudes: the bellweather. Oceanography 22:160-171.
[54] Tatters, A. O., F.-X. Fu, and D. A. Hutchins. 2012. High CO2 and Silicate Limitation Synergistically Increase the Toxicity of Pseudo-nitzschia fraudulenta. PLoS ONE 7:e32116; Fu, F., A. Tatters, and D. Hutchins. 2012. Global change and the future of harmful algal blooms in the ocean. Marine Ecology Progress Series 470:207–233; Flynn, K. J., D. R. Clark, A. Mitra, H. Fabian, P. J. Hansen, P. M. Glibert, G. L. Wheeler, D. K. Stoecker, J. C. Blackford, and C. Brownlee. 2015. Ocean acidification with (de)eutrophication will alter future phytoplankton growth and succession. Proceedings of the Royal Society of London B: Biological Sciences 282:20142604.
[55] Anderson, D. M., et al. 2014. Understanding interannual, decadal level variability in paralytic shellfish poisoning toxicity in the Gulf of Maine: The HAB Index. Deep Sea Research Part II: Topical Studies in Oceanography 103:264–276.

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provoke organ failure, and ultimately death in several marine mammal species, from small sea otters, seals, sea lions, to large whales.[56]

In the past three decades, HABs seem to have become more frequent, more intense, and more widespread.[57] Indeed, scientists and federal officials believe a HAB from central California to the Alaska Peninsula caused sea lion strandings and bird deaths along the West Coast, and the deaths of at least 30 large whales in the Gulf of Alaska, including ESA-listed humpback and fin whales.[58] The unusual mortality event is ongoing, with a total of 45 large whale strandings in the Western Gulf of Alaska in 2015, and nearly 25 since August 8, 2016.[59] BOEM's Draft EIS unlawfully ignores these significant impacts.

ii. BOEM Failed To Adequately Analyze the Impacts of Black Carbon Emissions

In addition, BOEM's Draft EIS fails to analyze the unique, detrimental impacts of black carbon emissions. Black carbon—or soot—consists of particles or aerosols released through the inefficient burning of fossil fuels, biofuels, and biomass.[60] Black carbon warms the atmosphere, but it is a solid, not a gas. Unlike greenhouse gases, which warm the atmosphere by absorbing longwave infra-red radiation, soot has a warming impact because it absorbs shortwave radiation, or visible light.[61]

Black carbon is an extremely powerful greenhouse pollutant. Scientists have described the average global warming potential of black carbon as about 500 times that of carbon dioxide over a 100 year period.[62] This powerful warming impact is remarkable given that black carbon

[56] McHuron, E. A., D. J. Greig, K. M. Colegrove, M. Fleetwood, T. R. Spraker, F. M. D. Gulland, J. T. Harvey, K. A. Lefebvre, and E. R. Frame. 2013. Domoic acid exposure and associated clinical signs and histopathology in Pacific harbor seals (Phoca vitulina richardii). Harmful Algae 23:28–33; Kirkley, K. S., J. E. Madl, C. Duncan, F. M. Gulland, and R. B. Tjalkens. 2014. Domoic acid-induced seizures in California sea lions (Zalophus californianus) are associated with neuroinflammatory brain injury. Aquatic Toxicology 156:259–268; Jensen, S.-K., J.-P. Lacaze, G. Hermann, J. Kershaw, A. Brownlow, A. Turner, and A. Hall. 2015. Detection and effects of harmful algal toxins in Scottish harbour seals and potential links to population decline. Toxicon 97:1–14.
[57] Lewitus, A. J., et al. 2012. Harmful algal blooms along the North American west coast region: History, trends, causes, and impacts. Harmful Algae 19:133–159; Hallegraeff, G. M., editor. 2014. Impacts of climate change on harmful algal blooms and seafood safety. Assessment and management of seafood safety and quality: current practices and emerging issues. Rome.
[58] NOAA, West Coast Harmful Algal Bloom, http://oceanservice.noaa.gov/news/sep15/westcoast-habs html, updated May 2, 2016.
[59] NMFS, 2016 Large Whale Unusual Mortality Event in the Western Gulf of Alaska, updated Aug. 8, 2016, http://www nmfs.noaa.gov/pr/health/mmume/large_whales_2015.html.
[60] Quinn, P.K., T.S. Bates, E. Baum, N. Doubleday, A. Fiore, M. Flanner, A. Fridlind, T. Garrett, D. Koch, S. Menon, D. Shendell, A. Stohl, and S.G. Warren. 2007. Short-lived pollutants in the Arctic: Their climate impact and possible mitigation strategies.
[61] Chameides, W.L., and M. Bergin. 2002. Soot takes center stage. *Science* 297:2214-2215.
[62] Hansen, J., M. Sato, R. Ruedy, P. Kharecha, A. Lacis, R. Miller, L. Nazarenko, K. Lo, G. A. Schmidt, G. Russell, I. Aleinov, S. Bauer, E. Baum, B. Cairns, V. Canuto, M. Chandler, Y. Cheng, A. Cohen, A. Del Genio, G. Faluvegi, E. Fleming, A. Friend, T. Hall, C. Jackman, J. Jonas, M. Kelley, N. Y. Kiang, D. Koch, G. Labow, J. Lerner, S. Menon, T. Novakov, V. Oinas, J. Perlwitz, J. Perlwitz, D. Rind, A. Romanou, R. Schmunk, D. Shindell, P. Stone, S. Sun, D. Streets, N. Tausnev, D. Thresher, N. Unger, M. Yao, and S. Zhang. 2007. Dangerous human-made interference with climate: a GISS modelE study. Atmospheric Chemistry and Physics 7:2287-2312; *see also* Reddy, M.S., and O. Boucher. 2007. Climate impact of black carbon emitted from energy consumption in the world's regions. *Geophysical Research Letters* 34, L11802, doi:10.1029/2006GLO28904.

remains in the atmosphere for only about four to seven days, with a mean residence time of 5.3 days.[63] Black carbon contributes to Arctic warming through the formation of "Arctic haze" and through deposition of particles on snow and ice which transform heat-reflecting surface into heat-absorbing surface thereby increasing heat absorption.[64]

Soot also contributes to heating when it is deposited on snow because it reduces reflectivity of the white snow and instead tends to absorb radiation. A recent study indicates that the direct warming effect of black carbon on snow can be three times as strong as that due to carbon dioxide during springtime in the Arctic.[65] Black carbon emissions that occur in or near the Arctic contribute the most to the melting of the far north.[66]

Allowing black carbon emissions to increase in Alaska as the result of oil and gas development will accelerate warming and consequent loss of seasonal sea ice, leading to the extinction of ice-dependent species and other species and harm to public health and welfare.

iii. BOEM Failed To Adequately Analyze the Impacts of Climate Change on Oil and Gas Infrastructure

Climate change is already impacting Alaska. Sea level rise in many regions of Alaska is advancing much faster than the global average, with particularly rapid increases in sea level occurring in recent years.[67] Recent studies have found that a mean global sea-level rise of at least 1 to 2 meters is highly likely within this century.[68] Studies that have reconstructed sea-level rise based on the geological record, including oxygen isotope and coral records, have found that larger rates of sea-level rise of 2.4 to 4 meters per century are possible.[69] And a new study shows that Greenland's glacier has dramatically melted in the last decade and it alone would cause 1.5 feet of sea level rise.[70]

Shorelines are eroding at an accelerating rate due to the combined effects of sea-ice loss, increasing sea surface temperatures, increasing terrestrial permafrost degradation, rising sea

[63] Reddy and Boucher 2007.
[64] Quinn et al. 2007; Reddy and Boucher 2007.
[65] Flanner, M. G., C. S. Zender, J. T. Randerson, and P. J. Rasch (2007), Present-day climate forcing and response from black carbon in snow. J. Geophys. Res., 112, D11202, doi:10.1029/2006JD008003.
[66] Reddy and Boucher 2007; Quinn et al. 2007.
[67] Richter-Menge, J., J. E. Overland, M. Svoboda, J. Box, M. J. J. E. Loonen, A. Proshutinsky, V. Romanovsky, D. Russell, C. D. Sawatzky, M. Simpkins, R. Armstrong, I. Ashik, L.-S. Bai, D. Bromwich, J. Cappelen, E. C. Carmack, J. Comiso, B. Ebbinge, I. E. Frolov, J. C. Gascard, M. Itoh, G. J. Jia, R. Krishfield, F. McLaughlin, W. Meier, N. Mikkelsen, J. Morison, T. Mote, S. Nghiem, D. K. Perovich, I. V. Polyakov, J. D. Reist, B. Rudels, U. Schauer, A. Shiklomanov, K. Shimada, V. T. Sokolov, M. Steele, M.-L. Timmermans, J. Toole, B. Veenhuis, D. Walker, J. Walsh, M. Wang, A. Weidick, and C. Zöckler. 2008. Arctic Report Card 2008, http://www.arctic.noaa.gov/reportcard.
[68] Jevrejeva, S., J. C. Moore, and A. Grinsted. 2010. How will sea level respond to changes in natural and anthropogenic forcing by 2100. Geophysical Research Letters 37:L07703, doi:07710.01029/02010GL042947.
[69] Milne, G. A., W. R. Gehrels, C. W. Hughes, and M. E. Tamisiea. 2009. Identifying the causes of sea-level change. Nature Geoscience 2:471-478.
[70] Mouginot, J.; E. Rignot, B. Scheuchl, I. Fenty, A. Khazendar, M. Morlighem, A. Buzzi, and J. Paden. 2015. Fast retreat of Zachariæ Isstrøm, northeast Greenland. Science.

levels, and increases in storm power and corresponding wave action.[71] And permafrost is thawing in many parts of northern Alaska.[72] As permafrost thaws, it releases carbon dioxide and the powerful greenhouse gas methane into the atmosphere, which contribute to further warming in a reinforcing feedback loop.[73] Prior analysis by BOEM has admitted that "[c]hanges in permafrost have caused failure of buildings and costly increases in road maintenance in Alaska due to their damage," and that "[m]odels project that permafrost in Alaska will continue to thaw . . . and some models project that near-surface permafrost will be lost entirely from large parts of Alaska by the end of the century."[74] And climate change has, and will, increase the frequency and severity of storms.[75]

These changing conditions will impact the stability and operations of oil and gas drilling in Alaska. This will also impact the safety and vulnerability of the operations, increasing the risk of accidents, oil spills, and other hazards. Permafrost melt will impact onshore support, access, pipelines and infrastructure. Changes in temperature and sea level rise will affect the seasonal availability of ice roads and access, and increase the need for other methods of access. Increased storm severity will affect oil and gas infrastructure. These predictable changes in the near future must be evaluated, modeled, and disclosed by BOEM. Yet BOEM's Draft EIS fails to do so, in violation of NEPA.

iv. BOEM Failed To Adequately Address Other Climate Change Impacts

BOEM's Draft EIS also fails to adequately address other climate change impacts. While BOEM acknowledges climate change will increase negative impacts to marine life, water quality, the coastal environment, and public health in and around the Inlet,[76] BOEM's analysis of these impacts is entirely cursory.

Numerous studies demonstrate the harmful impacts of climate change on these resources and must be adequately accounted for and analyzed by BOEM. For example, the U.S. Environmental Protection Agency has found that climate change will impact "mortality and morbidity associated with increases in average temperatures, which increase the likelihood of heat waves;"[77] and that climate change will negatively affect water supplies and water quality, as well as adverse effects from extreme events such as floods and droughts.[78] Other studies show

[71] Jones, B. M., C. D. Arp, M. T. Jorgensen, K. M. Hinkel, J. A. Schmutz, and P. L. Flint. 2009. Increase in the rate and uniformity of coastline erosion in Arctic Alaska. Geophysical Research Letters 36, L03503, doi:10.1029/2008GL036205.
[72] Richter-Menge, J., and J. E. Overland, Eds. 2010. Arctic Report Card 2010, http://www.arctic.noaa.gov/reportcard; Osterkamp, T. E., and J. C. Jorgenson. 2006. Warming of permafrost in the Arctic National Wildlife Refuge, Alaska. Permafrost and Periglacial Processes 17:65-69.
[73] Schaefer, K., T. Zhang, L. Bruhwiler, and A. P. Barrett. 2011. Amount and timing of permafrost carbon release in response to climate warming. Tellus Series B-Chemical and Physical Meteorology 63B:165-180.
[74] Draft EIS on 2017-2022 OCS Oil and Gas Plan, Appdx. C at C-31.
[75] *See e.g.*, EPA Final Endangerment Finding, 74 Fed. Reg. at 66,497-98
[76] Draft EIS at 5-41 to 5-42; 5-44 to 5-45; 5-66.
[77] 74 Fed. Reg. at 66,497-98.
[78] *Id*. at 66,498.

that that climate change could "severely exacerbate the combined impacts of" other sources of ocean pollution.[79]

Studies also show that climate change is already causing changes in distribution, phenology, physiology, genetics, species interactions, ecosystem services, demographic rates, and population viability: many animals and plants are moving poleward and upward in elevation, shifting their timing of breeding and migration, and experiencing population declines and extirpations.[80] Because climate change is occurring at an unprecedented pace with multiple synergistic impacts, climate change is predicted to result in catastrophic species losses during this century. For example, the IPCC concluded that 20 percent to 30 percent of plant and animal species will face an increased risk of extinction if global average temperature rise exceeds 1.5°C to 2.5°C relative to 1980-1999, with an increased risk of extinction for up to 70 percent of species worldwide if global average temperature exceeds 3.5°C relative to 1980-1999.[81] BOEM's superficial analysis fails to adequately account for such impacts.

III. BOEM Failed To Take a Hard Look at the Direct, Indirect, and Cumulative Impacts of Other Effects of Lease Sale 244

BOEM's Draft EIS fails to take a hard look at the direct, indirect, and cumulative effects of several other environmental impacts that could result from Lease Sale 244. These effects include impacts from unconventional well stimulation like offshore fracking and acidizing; impacts from air and water pollution; impacts to already imperiled wildlife; and impacts from oil spills. Such failures violate NEPA.

A. BOEM Failed To Take a Hard Look at the Impacts from Offshore Fracking and Acidizing

BOEM's Draft EIS must consider the impacts of unconventional well stimulation. Unconventional well stimulation techniques are increasingly being employed in Alaska, including offshore.[82] In fact, an oil company recently announced plans to conduct the first large-

[79] C. Nellemann, S. Hain & J. Alder, In Dead Water: Merging of Climate Change with Pollution, Over-Harvest, and Infestations in the World's Fishing Grounds at 57 (2008).
[80] *See* Parmesan, C. and G. Yohe, A globally coherent fingerprint of climate change impacts across natural systems, 421 Nature 37–42 (2003); Root, T. *et al.*, Fingerprints of global warming on wild animals and plants, 421 Nature 57–60 (2003); Chen, I. *et al.*, Rapid range shifts of species associated with high levels of climate warming, 333 Science 1024–1026 (2011).
[81] IPCC, 2007: Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change 48 [Core Writing Team, Pachauri, R.K and Reisinger, A.(eds.)]. Other studies have predicted similarly severe losses: 15%-37% of the world's plants and animals committed to extinction by 2050 under a mid-level emissions scenario, *see* Thomas *et al.*, Extinction risk from climate change, 427 Nature 145–8 (2004)); the potential extinction of 10% to 14% of species by 2100 if climate change continues unabated, *see* Maclean, I. M. D. and R. J. Wilson, Recent ecological responses to climate change support predictions of high extinction risk, 108 Proceedings of the National Academy of Sciences of the United States of America 12337-12342 (2011); and the loss of more than half of the present climatic range for 58% of plants and 35% of animals by the 2080s under the current emissions pathway, in a sample of 48,786 species, *see* Warren, R. J. *et al.*, Increasing Impacts of Climate Change Upon Ecosystems with Increasing Global Mean Temperature Rise, 106 Climatic Change 141–77 (2011).
[82] FracFocus, https://fracfocusdata.org/DisclosureSearch/Search.aspx (map search for Alaska).

scale, multi-staged frack in Cook Inlet.[83] Unconventional well stimulation treatments like fracking and acidizing cause environmental damages beyond those of conventional oil and gas development. Fracking and acidizing produce water and air pollution, increase the risk of earthquakes and oil spills, and prolong the life of offshore infrastructure and our use of dirty fossil fuels. BOEM must consider these impacts.

Water contamination is a significant risk of fracking because of the hundreds of chemicals used in fracking fluid. For example, a peer-reviewed study that examined fracking fluid products determined that more than 75 percent of the chemicals could affect the skin, eyes, and other sensory organs, and the respiratory and gastrointestinal systems; approximately 40 to 50 percent could affect the brain/nervous system, immune system, cardiovascular system, and the kidneys; 37 percent could affect the endocrine system; and 25 percent could cause cancer and mutations.[84] In addition to posing a significant health and safety risk to humans, fracking chemicals can kill or harm a wide variety of marine life. Scientific research has indicated that 40 percent of the chemicals used in fracking can harm aquatic animals and other wildlife.[85]

For example, some of the chemicals used in fracking operations can break down into nonylphenol, a very toxic endocrine disrupting substance with a wide range of harmful effects that include the development of intersex fish and altered sex ratios at the population level.[86] Nonylphenol can also inhibit the development, growth, and survival of marine invertebrates, and has been shown to bioaccumulate in marine mammal species such as sea otters.[87]

Phenol formaldehyde resins are also used in offshore fracking, including in prior small fracture stimulations in Cook Inlet.[88] These resins are toxic and can cause cancer and mutations; if released into the marine environment, these pollutants have the potential to absorb other chemical compounds such as nonylphenol, increasing their toxicity to marine life.[89] Other chemicals also previously used in offshore fracks in the Inlet are inherently toxic to marine life.[90] Indeed, some chemicals used in fracking are among the most toxic in the entire world with respect to aquatic life.[91]

[83] Alaska DeMarban, Groundbreaking Fracking Effort, Alaska Dispatch News, May 17, 2016, http://www.adn.com/energy/article/groundbreaking-fracking-plus-first-new-oil-production-years-tap-cook-inlet/2016/04/02/.
[84] Colborn, Theo, et al. 2011. Natural Gas Operations for a Public Health Perspective, 17 Human and Ecological Risk Assessment 1039; Elliot, E.G. et al. 2016. A systematic evaluation of chemicals in hydraulic –fracturing fluids and wastewater for reproductive and developmental toxicity. Journal of Exposure Science and Environmental Epidemiology 1–10.
[85] CCST. 2014. Advanced Well Stimulation Technologies in California: An Independent Review of Scientific and Technical Information. August 28, 2014; Christopher D. Kassotis, et al. 2015. Endocrine-Disrupting Activity of Hydraulic Fracturing Chemicals and Adverse Health Outcomes After Prenatal Exposure in Male Mice. Endocrinology. 156(12):4458-73. DOI: 10.1210/en.2015-1375.
[86] Diehl, J., et al. 2012. The distribution of 4-nonylphenol in marine organisms of North American Pacific Coast estuaries. Chemosphere 87:490-497.
[87] *Id*.
[88] *See* Hydraulic Fracturing Fluid Product Component Information Disclosure, Hilcorp Alaska, State Waters - Kenai Quadrangle, Apr. 6, 2013.
[89] Mato, Y. et al. 2001. Plastic resin pellets as a transport medium for toxic chemicals in the marine environment. Environmental Science & Technology 35:318-324.
[90] Fluid Product Disclosure, *supra* n. 88.
[91] CCST. 2015, Vol. II at 76.

Another recent study found that oil companies use dozens of extremely hazardous chemicals to acidize wells. Specifically, the study found that almost 200 different chemicals have been used and that at least 28 of these substances are F-graded hazardous chemicals—carcinogens, mutagens, reproductive toxins, developmental toxins, endocrine disruptors or high acute toxicity chemicals.[92] Hydrofluoric acid, for example, is acutely toxic, and exposure to fumes or very short-term contact with its liquid form can cause severe burns. The study notes that acidizing chemicals can make up as much as 18 percent of the fluid used in these procedures.[93] Further, each acidization can use as much as hundreds of thousands of pounds of some chemicals.[94]

Wastewater injection—a way oil companies dispose of wastewaters generated by fracking—can result in leaks and contamination through the loss of well casing integrity. Studies have shown that 30 percent of offshore oil wells in the Gulf of Mexico experienced well casing damage in the first five years after drilling, and damage increased over time to 50 percent after 20 years.[95] Well stimulation can increase the risk of well casing damage.[96] A recent scientific study found that older wells can become pathways for fluid migration, and that the high injection pressures used in fracking can "increase this risk significantly."[97] For this same reason, fracking can also increase the risk of oil and other spills. This disposal method can also result in the contamination of drinking water.[98]

Air pollution from fracking and acidizing is also well documented.[99] Pollutants released during fracking pose serious health risks, including carcinogenicity and endocrine disruption.[100] VOCs emitted during offshore fracking include the "BTEX compounds"—benzene, toluene, ethyl benzene and xylene—which Congress has declared hazardous air pollutants.[101] Many of these VOCs are associated with serious short-term and long-term effects to the respiratory,

[92] Khadeeja Abdullah, Timothy Malloy, Michael K. Stenstrom & I. H. (Mel) Suffet. 2016. Toxicity of acidization fluids used in California oil exploration, Toxicological & Environmental Chemistry.
[93] *Id.*
[94] *Id.*
[95] Vengosh, A. et al. 2014. A critical review of the risks to water resources from unconventional shale gas development and hydraulic fracturing in the United States. Environmental Science & Technology 48:8334-8348; Davies, R.J. et al. 2014. Oil and gas wells and their integrity: Implications for shale and unconventional resource exploitation. Marine and Petroleum Geology 56:239-254.
[96] Davies, et al. 2014; U.S. EPA, Assessment of the Potential Impacts of Hydraulic Fracturing for Oil and Gas on Drinking Water Resources, External Review Draft (June 2015) at 6-11.
[97] California Council on Science and Technology. 2015. An Independent Scientific Assessment of Well Stimulation in California, Volume II. Potential Environmental Impacts of Hydraulic Fracturing and Acid Stimulations, 20 July, at 39.
[98] Dominic C. DiGiulio and Robert B. Jackson. 2016. Impact to Underground Sources of Drinking Water and Domestic Wells from Production Well Stimulation and Completion Practices in the Pavillion, Wyoming, Field. Environmental Science and Technology. DOI: 10.1021/acs.est.5b04970.
[99] Colborn, T. et al. 2012. An exploratory study of air quality near natural gas operations; Human and Ecological Risk Assessment: An International Journal, DOI:10.1080/10807039.2012.749447; McKenzie, L. et al. 2012. Human health risk assessment of air emissions from development of unconventional natural gas resources. Sci Total Environ 424:79-87.
[100] Colborn, T. et al. 2011; McKenzie, L. et al. 2014; Food and Water Watch. 2012. Fracking: The New Global Water Crisis, March 7, 2012.
[101] 42 U.S.C. § 7412(b).

nervous and circulatory systems.[102] Additionally, VOCs create ground-level ozone, or smog, which can contribute to asthma,[103] premature death, stroke, heart attack and low birth weight. Benzene is also a known carcinogen,[104] and has been documented in people living within a 10-mile radius of fracked wells.[105]

Offshore fracking can also result in airborne crystalline silica dust. While the most common exposure to silica dust is in workers close to silica sand, there are documented cases of silica dust exposure and resultant harms suffered in neighboring communities.[106] Silica quartz, commonly used in offshore frack jobs, can create dangerous health problems, including cancer and silicosis.[107]

Offshore fracking and acidizing also emit greenhouse gases and contribute to climate disruption, particularly due to methane leakage.[108] New research shows methane leakage from some wells may be as high at 17.3 percent.[109] Moreover, new research has shown that unconventional wells are up to 2.7 times more likely than a conventional well to have a cement or casing impairment, which can lead to methane leaks.[110]

In addition, new studies have drawn a strong connection between the recent rise in fracking wastewater injection and increased earthquake rates.[111] For example, the USGS has recognized that wastewater disposal from fracking is a "contributing factor" to the six-fold

[102] Colborn, T. et al. 2011.
[103] Jerrett, M. et al. 2009.
[104] Gilman, J.B. et al. 2010. VOCs in the Greater Los Angeles Basin: Characterizing the gas-phase chemical evolution of air masses via multi-platform measurements during CalNEX, www.esrl noaa.gov/csd/projects/calnex/meetings/datawkshpMay2011/monday/Gilman.pdf.
[105] Reutman, S.R. et al. 2002. Evidence of reproductive endocrine effects in women with occupational fuel and solvent exposures. Environ Health Perspectives 110:805-811; McKenzie, L. et al. 2014.
[106] Mayer, S. 2010. Industrial dust plagues northwest residents. Bakersfield Californian, 26 December 2010, at http://www.bakersfield.com/news/2010/12/27/industrial-dust-plagues-northwest-residents html; *Bhagia*, L.J. 2012. Non-occupational exposure to silica dust. Indian Journal of Occupational & Environmental Medicine 16:3; Schenker, M.B., et al. 2009. Pneumoconiosis from agricultural dust exposure among young California farmworkers. Environ. Health Perspectives 117:6.
[107] Wisconsin Department of Natural Resources. 2011. Report to Natural Resources Board: Silica Study; Raizner, J. 2013. Offshore Fracking Injuries. Oil and Gas Monitor, 13 September 2013, at www.oilgasmonitor.com/offshore-fracking-injuries/5919/.
[108] Zavala-Araiza, D. et al. 2015. Reconciling divergent estimates of oil and gas methane emissions. PNAS 112: 15597-15602; Karion, A. et al. 2013. Methane emissions estimate from airborne measurements over a western United States natural gas field. Geophysical Research Letters 40: 4393-4397; Peischl, J. et al. 2013. Quantifying sources of methane using light alkanes in the Los Angeles basin, California. Journal of Geophysical Research: Atmospheres 118: 1-17; Pétron Tollefson, J. 2013. Methane leaks erode green credentials of natural gas: losses of up to 9% show need for broader data on US gas industry's environmental impact. Nature 493: 12; Howarth, R.W. et al. 2011. Methane and the greenhouse-gas footprint of natural gas from shale formations. Climatic Change 106: 679-69.
[109] Caulton, Dana R. et al., Toward a Better Understanding and Quantification of Methane Emissions from Shale Gas Development, 111 Proc. Natl. Acad. Sciences 17 (2014); Schneising, Oliver, et al. 2014. Remote Sensing of Fugitive Methane Emissions from Oil and Gas Production in North American Tight Geologic Formations, Earth's Future 2, doi:10.1002/2014EF000265; Allen, D. T. et al. 2013. Measurements of Methane Emissions at Natural Gas Production Sites in the United States, 110 Proc. Natl. Acad. Sci. 44.
[110] Ingraffea, Anthony R, et al. 2014. Assessment and Risk Analysis of Casing and Cement Impairment in Oil and Gas Wells in Pennsylvania, 2000 – 2012, 111 Proc. Natl. Acad. Sciences 30.
[111] Van de Elst, Nicholas J. et al. 2013. Enhanced Remote Earthquake Triggering at Fluid-Injection Sites in the Midwestern United States, 341 *Science* 164.

increase in the number of earthquakes in Oklahoma.[112] Another recent study also found that wastewater injection is responsible for the dramatic rise in the number of earthquakes in Colorado and New Mexico since 2001.[113] Wastewater injection has been scientifically linked to earthquakes of magnitude three and greater in at least seven states: Arkansas,[114] Colorado,[115] Ohio,[116] Oklahoma,[117] Texas,[118] New Mexico,[119] and California.[120]

But it is not just wastewater injection that can lead to earthquakes. The practice of fracking itself has been found to contribute directly to seismic events.[121] Even if the earthquakes that fracking directly generates are small, fracking could be contributing to increased stress in faults that leaves those faults more susceptible to otherwise naturally triggered earthquakes of a greater magnitude.[122] This is a significant concern for earthquake-prone Alaska. But BOEM's Draft EIS ignores these impacts, in violation of NEPA.

B. <u>BOEM Failed To Take a Hard Look at the Impacts on Imperiled Species</u>

BOEM failed to take a hard look at the direct, indirect, and cumulative impacts of Lease Sale 244 on species found in and around Cook Inlet that are already struggling to survive. In particular, BOEM failed to adequately consider impacts on critically endangered Cook Inlet beluga whales and North Pacific right whales, and threatened Steller's eider.

1. BOEM Failed To Take a Hard Look at the Impacts on Cook Inlet Beluga Whales

BOEM's Draft EIS fails to take a hard look at the impacts of Lease Sale 244 on Cook Inlet beluga whales. Cook Inlet belugas are critically endangered and one of the most endangered whale species in the world. The population of Cook Inlet beluga whales has declined precipitously in the last 30 years. In 1979, the estimated population of Cook Inlet beluga whales

[112] Sumy, D. F., *et al.* 2014. Observations of static Coulomb stress triggering of the November 2011 *M*5.7 Oklahoma earthquake sequence, *J. Geophys. Res. Solid Earth*, 119, 1904–1923, DOI:10.1002/2013JB010612; USGS, Record Number of Oklahoma Tremors Raises Possibility of Damaging Earthquakes, May 2, 2014.
[113] Justin L. Rubinstein, et al. 2014. The 2001 – Present Induced Earthquake Sequence in the Raton Basin of Northern New Mexico and Southern Colorado. *Bulletin of the Seismological Society of America*, 2014 DOI: 10.1785/0120140009.
[114] E&E News, USGS, Okla. warn of more drilling-related earthquakes in State, Mike Soraghan. Oct. 25, 2013.
[115] *Id.*
[116] Ohio Dept. of Nat. Resources (2012) *Executive Summary: Preliminary Report on the Northstar 1 Class II Injection Well and the Seismic Events in the Youngstown, Ohio Area*; Fountain, Henry, Disposal halted at well after new quake in Ohio, *New York Times*, Jan. 1, 2012.
[117] Holland, Austin, Examination of possibly induced seismicity from hydraulic fracturing in the Eola Field, Garvin County, Oklahoma, Oklahoma Geological Survey Open-File Report OF1-2011 (2011).
[118] Frohlich, Cliff (2012) Two-year survey comparing earthquake activity and injection-well locations in the Barnett Shale, Texas. *Proceedings of the National Academy of Sciences*. Vol 109. No. 35.
[119] Rubinstein, J. L, et al. 2012.
[120] T. H. W. Goebel, et al. 2016. Wastewater disposal and earthquake swarm activity at the southern end of the Central Valley, California, Geophysical Research Letters. Vol. 43, Issue 3. Pages 1092–1099.
[121] Van der Elst, 2013; BC Oil & Gas Commission, Industry Bulletin: 2015-32, Dec. 15, 2015, https://www.bcogc.ca/node/12951/download.
[122] Van der Elst, et al. 2013.

was approximately 1,300.[123] By 2012, the population had dropped by more than 75 percent to only 312 whales, where the population generally remains today.[124] Despite a cessation of subsistence hunting in 1999, the population of Cook Inlet beluga whales has not rebounded. In fact, it declined at an average rate of 1.5 percent per year between 1999 and 2008.[125]

Accordingly, the National Marine Fisheries Service ("NMFS") listed the Cook Inlet beluga whale as endangered under the ESA in October 2008.[126] And NMFS designated 3,013 square miles of biologically important marine habitat in the Inlet as critical habitat in April 2011.[127] Despite these increased protections, the population has not rebounded and remains critically imperiled. NMFS has estimated a 26 percent risk that the belugas will be extinct in one hundred years and a 70 percent risk of extinction in three hundred years.[128]

In 2015, NMFS issued a draft recovery plan for Cook Inlet beluga whales in which it found the whales face a high threat of extinction for the foreseeable future. Threats with the potential to limit the recovery of the species include anthropogenic noise; catastrophic events such as oil spills or earthquakes; prey reduction; pollution; and the cumulative effects of multiple stressors, among others.[129] In 2016, NMFS released its "Species in the Spotlight: Survive to Thrive" initiative, a concerted agency-wide effort to spotlight and save highly at-risk species. Cook Inlet belugas are one of the eight species. According to NMFS, "[t]he rapid decline and dire status of the Cook Inlet beluga whale population makes it a priority for NMFS and [its] partners to prevent extinction and promote recovery of this iconic species."[130] NMFS recently released a Priority Actions plan for Cook Inlet belugas which includes the "key action" of "reduc[ing] the threat of anthropogenic noise."[131]

Oil and gas exploration, development, and production activities represent a serious threat to Cook Inlet beluga whales due to increased noise. Anthropogenic noise pollution can mask marine mammal communications at almost all frequencies these mammals use.[132] "Masking" is a "reduction in an animal's ability to detect relevant sounds in the presence of other sounds."[133] Vessel noise can cover important frequencies these animals use for more complex communications. NMFS has recognized that this masking may affect marine mammal survival and reproduction by decreasing these animals' ability to "[a]ttract mates, [d]efend territories or

[123] National Marine Fisheries Service. 2008. Conservation Plan for the Cook Inlet beluga whale (*Delphinapterus leucas*). National Marine Fisheries Service, Juneau, Alaska at 29.
[124] Sheldon et al., Aerial Surveys of Belugas in Cook Inlet, Alaska, June 20, 2012; National Marine Fisheries Service, Alaska Marine Mammal Stock Assessment Report: BELUGA WHALE (*Delphinapterus leucas*): Cook Inlet Stock, Dec. 30, 2015.
[125] NMFS, Conservation Plan at 1.
[126] 73 Fed. Reg. 62919 (October 22, 2008).
[127] 76 Fed. Reg. 20180 (April 11, 2011).
[128] 73 Fed. Reg. at 62,927.
[129] *See* National Marine Fisheries Service, Draft Recovery Plan for the Cook Inlet Beluga Whale (*Delphinapterus leucas*), May 15, 2015.
[130] National Marine Fisheries Service, Cook Inlet Beluga Whale 5-Year Action Plan, Jan. 2016 at 2.
[131] *Id.*
[132] *See, e.g.*, Hildebrand, J.A., *Impacts of Anthropogenic Sound, in* MARINE MAMMAL RESEARCH: CONSERVATION BEYOND CRISIS (Reynolds, J.E. III et al., eds. 2006); Weilgart, L., 2007, The Impacts of Anthropogenic Ocean Noise on Cetaceans and Implications for Management, 85 CANADIAN J. ZOOLOGY 1091-1116 (2007).
[133] OCEAN NOISE AND MARINE MAMMALS, at 96.

resources, [e]stablish social relationships, [c]oordinate feeding, [i]nteract with parents, or offspring, [and] [a]void predators or threats."[134] Studies have also found that chronic exposure to boat traffic and noise can cause whales to reduce their time spent feeding.[135]

In addition to masking effects, marine mammals have displayed a suite of stress-related responses from increased ambient and local noise levels, including beluga whales. For example, in a noise exposure study using a captive beluga, increased levels of stress hormones were documented.[136] Stress due to noise can lead to long-term health problems, and may pose increased health risks for populations by weakening the immune system and potentially affecting fertility, growth rates, and mortality.[137]

Moreover, NMFS's draft recovery plan for Cook Inlet belugas states that "[t]he effect of anthropogenic noise, particularly the combined effect of different sound sources occurring simultaneously or consecutively, has the potential to affect beluga acoustic perception, communication, echolocation, and behavior (such as foraging and movement patterns)."[138] Additionally, the long-term effects of such impacts "may induce chronic effects altering the health of individual [Cook Inlet] belugas, which in turn have consequences at the population level (i.e., decreased survival and reproduction)."[139] Yet BOEM does not adequately consider these impacts.

Instead, BOEM's Draft EIS states that Lease Sale 244 will have only "negligible to minor" impacts on Cook Inlet belugas because animals will move away from seismic airguns and because the animals are habituated to noise from vessels.[140] But these contradictory statements are insufficient to comply with NEPA. Moving away from (i.e., avoiding) certain areas can be harmful to the population, especially if animals are moving away from feeding, breeding, or other biologically important areas. And BOEM's conclusion ignores the fact that high level of noise generated by oil and gas activities could harm belugas that do not move away from the area. Moreover, the only way to truly know if a population has habituated is if "studies adopt a long-term experimental design involving sequential sampling of the same individuals at different levels of exposure to a disturbance, [if not, then] they will be unable to meet the conditions required to detect behavioural habituation or sensitisation."[141] No such studies exist for Cook Inlet beluga whales. Indeed, according to Bedjer et al., "several studies have indicated that physiological evidence of a response could be detected in animals even when they exhibited little or no behavioural reaction or sign of disturbance (Moen et al. 1982, Culik et al. 1990, Wilson et al. 1991, Nimon et al. 1995, Regel & Putz 1997, Ratz & Thompson 1999, Müllner et al. 2004)."

[134] Jason Gadamke, Ocean Sound & Ocean Noise: Increasing knowledge through research partnerships, May 2014.
[135] *See i.e.* Williams, R. D., et al., 2006, Estimating relative energetic costs of human disturbance to killer whales (*Orcinus orca*), *Biological Conservation*, 133: 301-311.
[136] Romano, T.A. *et al*., 2004, Anthropogenic sound and marine mammal health: measures of the nervous and immune systems before and after intense sound exposure, *Canadian Journal of Aquatic Science*, 61: 1124-1134.
[137] *Id.*
[138] Draft Recovery Plan at 103.
[139] *Id.*
[140] Draft EIS at 4-102.
[141] Bejder, L.; A. Samuels; H. Whitehead; H. Finn and S. Allen. Impact assessment research: Use and misuse of habituation, sensitisation and tolerance in describing wildlife responses to anthropogenic stimuli. Marine Ecology Progress Series 395:177-185. (2009).

In addition, noise from oil and gas development can adversely impact Cook Inlet beluga whales by affecting the behavior of prey species. For years, fisheries in various parts of the world have complained that intense acoustic activities, particularly airgun surveys, have resulted in declines in catch.[142] A group of Norwegian scientists documented these declines in a Barents Sea fishery and found that catch rates of haddock and cod (the latter known for its particular sensitivity to low-frequency sound) plummeted in the vicinity of an airgun survey across a 1600-square-mile area; in another study, catch rates of rockfish were similarly shown to decline.[143] Drops in catch rates in these experiments range from 40 to 80 percent.[144] A variety of other species, including herring, zebrafish, pink snapper, and juvenile Atlantic salmon, have been observed to react to various noise sources with acute alarm.[145] Belugas in the inlet are known to feed on several species in the same families, including salmon and tomcod.[146] It is not clear whether the observed declines in catch rates are due to fish moving horizontally away from the source array or vertically within the water column, or both. Regardless, displacement of fish over a portion of the inlet could significantly affect the beluga's primary food source. Yet BOEM's Draft EIS fails to consider these impacts.

In addition to noise, oil industry activities pose risks to belugas and their habitat from oil spills, permitted discharges of wastes, increased vessel traffic, and physical displacement of the animals and their prey. And these risks are exacerbated by the other development activities in Cook Inlet. Indeed, NMFS cites these cumulative impacts as the most likely reason belugas have not recovered.[147] But BOEM does not adequately consider such impacts.

For example, BOEM dismisses the impact of large oil spills on Cook Inlet belugas by claiming that "[i]n all likelihood an oil spill would be contained, partially recovered, and perhaps burned, such that it is unlikely any belugas would be contacted by the spilled materials."[148] This conclusion is wholly unsupported, particularly in light of the overwhelming evidence of the difficulties in cleaning-up spilled oil. And it ignores the fact that NMFS lists oil spills and natural gas blowouts as a "high" potential threat to the recovery of the population, including mortality, compromised health, reduced fitness, and reduced carrying capacity.[149] It also ignores the substantial indirect impacts an oil spill could have on the population by contaminating or killing

[142] See, e.g., McCauley, R.D., J. Fewtrell, A.J. Duncan, C. Jenner, M.-N. Jenner, J.D. Penrose, R.I.T. Prince, A. Adhitya, J. Murdoch, and K. McCabe (2000), Marine seismic surveys: analysis and propagation of airgun signals, and effects of air-gun exposure on humpback whales, sea turtles, fishes, and squid, at 185.
[143] Engås, A., S. Løkkeborg, E. Ona, and A.V. Soldal (1996), Effects of Seismic Shooting on Local Abundance and Catch Rates of Cod (Gadus morhua) and Haddock (Melanogrammus aeglefinus), 53 Canadian Journal of Fisheries and Aquatic Sciences 2238-49 (1996); J.R. Skalski, W.H. Pearson, and C.I. Malme, Effects of sound from a geophysical survey device on catch-per-unit-effort in a hook-and-line fishery for rockfish (Sebastes spp.), Can. J. Fish. Aquat. Sci. 49: 1357-65 (1992). See also Løkkeborg, S., and A.V. Soldal (1993), The influence of seismic exploration with airguns on cod (Gadus morhua) behaviour and catch rates, ICES Mar. Sci. Symposium 196: 62-67.
[144] *Id.*
[145] *See* Blaxter, J.H.S., and R.S. Batty (1985), The development of startle responses in herring larvae, J. Mar. Biol. Ass'n U.K. 65: 737-750; Knudsen, F.R., P.S. Enger, and O. Sand (1992), Awareness reactions and avoidance responses to sound in juvenile Atlantic salmon, Salmo salar L., J. Fish Biol. 40: 523-534; McCauley et al., Marine seismic surveys at 126-61.
[146] Fall, J.A., D.J. Foster, and R.T. Stanek (1984), The use of fish and wildlife resources in Tyonek, Alaska, technical report series 105 from the Alaska Dep't of Fish & Game.
[147] NMFS, Draft Recovery Plan at 146.
[148] Draft EIS at 4-103.
[149] *Id.*

their prey. And, as explained further below, BOEM fails to consider the additive impacts from hundreds of small oil spills in in the Inlet over the life of activities conducted under Lease Sale 244. Such failures violate NEPA.

2. BOEM Failed To Take a Hard Look at the Impacts on North Pacific Right Whales

BOEM also failed to adequately consider the impacts to North Pacific right whales that could result from Lease Sale 244. North Pacific right whales are the most endangered large whale on the planet. Recent population estimates put the species at only 25 individuals.[150] The loss of even one animal could drive the species to extinction. Lease Sale 244 threatens this highly imperiled population through increased noise and increased risk of oil spills, among other threats. Yet BOEM failed to adequately consider these impacts.

It is well established that noise from airguns can cause a variety of negative impacts to baleen whales, including habitat displacement, disruption of vital foraging and breeding behaviors, and, in some circumstances, injuries and mortalities. For example, scientists have shown that a single seismic survey can cause endangered fin and humpback whales to stop vocalizing—an essential behavior for breeding and foraging—and can cause baleen whales to abandon their habitat.[151] And this can occur over an area of at least 100,000 square nautical miles near a seismic airgun source.[152]

Recent research reveals that chronic stress in North Atlantic right whales is associated with exposure to low frequency noise from ship traffic.[153] Specifically, "the adverse consequences of chronic stress often include long-term reductions in fertility and decreases in reproductive behavior; increased rates of miscarriages; increased vulnerability to diseases and parasites; muscle wasting; disruptions in carbohydrate metabolism; circulatory diseases; and permanent cognitive impairment."[154] These findings have lead researchers to conclude that "over the long term, chronic stress itself can reduce reproduction, negatively affect health, and even kill outright."[155] North Pacific right whales likely suffer in the same ways.

[150] NMFS, Alaska Marine Mammal Stock Assessments, 2015: NORTH PACIFIC RIGHT WHALE (Eubalaena japonica): Eastern North Pacific Stock, NOAA-TM-AFSC-323, Dec. 30, 2015, available at http://www nmfs.noaa.gov/pr/sars/pdf/stocks/alaska/2015/ak2015_northpacificrightwhale.pdf.
[151] *See*, e.g., Manuel Castellote et al., *Acoustic and Behavioral Changes by Fin Whales (*Balaenoptera physalus*) in Response to Shipping and Airgun Noise*, 147 Biological Conservation 115 (2012); S. Cerchio et al., *Seismic Surveys Negatively Affect Humpback Whale Singing Activity off Northern Angola*, 9 PLoS ONE e86464 (2014).C.W. Clark & G.C. Gagnon, *Considering the Temporal and Spatial Scales of Noise Exposures from Seismic Surveys on Baleen Whales* (IWC Sci. Comm. Doc. IWC/SC/58/E9) (2006); *see also* K. MacLeod. et al., *Abundance of Fin (Balaenoptera physalus) and Sei Whales (B. Borealis) Amid Oil Exploration and Development off Northwest Scotland*, 8 J. Cetacean Research & Mgmt. 247–54 (2006).
[152] C.W. Clark & G.C. Gagnon, *Considering the Temporal and Spatial Scales of Noise Exposures from Seismic Surveys on Baleen Whales* (2006) (IWC Sci. Comm. Doc. IWC/SC/58/E9); see also MacLeod, K., Simmonds, M.P., and Murray, E., Abundance of fin (Balaenoptera physalus) and sei whales (B. Borealis) amid oil exploration and development off northwest Scotland, Journal of Cetacean Research and Management 8: 247-254 (2006).
[153] Rolland, R, S. Parks, K. Hunt, M. Castellote, P. Corkeron, D. Nowacek, S. Wasser, and S. Kraus. 2012. Evidence that ship noise increases stress in right whales. Proceedings of the Royal Society B. February 8, 2012.
[154] *Id.*
[155] *Id.*

BOEM admits that North Pacific right whales may occur within the Cook Inlet region.[156] Nevertheless, BOEM inappropriately dismisses any consideration of noise impacts to North Pacific right whales because they do not occur within areas proposed for Lease Sale 244.[157] But the information above demonstrates that the species can suffer from noise generated by activities under Lease Sale 244 in areas outside the Inlet. BOEM must consider such impacts.

BOEM also dismisses the impacts of an oil spill on the species because North Pacific right whales are rarely seen in the area. But as the Deepwater Horizon and Exxon Valdez disasters demonstrate, oil spills can have widespread geographic impacts. And the fact that North Pacific right whales are not often seen in the area is not reason to dismiss potential impacts. Rather, the rarity of the species demonstrates that an oil spill could drive the species to extinction from direct impacts and impacts to prey.[158] BOEM must consider these impacts.

3. BOEM Failed To Take a Hard Look at the Impacts on Steller's Eiders

BOEM also failed to adequately consider impacts to threatened Steller's eiders. Seabirds are vulnerable to disorientation from oil and gas operations that increase light pollution. Artificial light attracts seabirds at night, especially nocturnally active species such as auks, shearwaters, and storm-petrels, and disrupts their normal foraging and breeding activities in several ways.[159] In a phenomenon called light entrapment, seabirds continually circle lights and flares on vessels and energy platforms, instead of foraging or visiting their nests, which can lead to exhaustion and mortality.[160] Seabirds also frequently collide with lights or structures around lights, causing injury or mortality, or on lighted platforms where they are vulnerable to injury, oiling or other feather contamination, and exhaustion.[161]

BOEM acknowledges that birds will be directly impacted by routine operations under Lease Sale 244 from mortality by colliding with, or incinerated by, offshore platforms and support vessels and that they could be harmed by oil spills.[162] BOEM also acknowledges that Steller's eiders migrate between the Arctic and Cook Inlet.[163] As such, the species will face threats from offshore drilling in both the Arctic region and the Cook Inlet region. Yet BOEM

[156] Draft EIS at 3-55.
[157] *Id.* at 4-121.
[158] *See e.g.*, NOAA. 2010. Analysis of Hydrocarbons in Samples Provided from the Cruise of the R/V WEATHERBIRD II, May 23-26, 2010, National Oceanic and Atmospheric Administration, Silver Spring, Maryland, 20910; Venn-Watson, S. *et al.* Adrenal Gland and Lung Lesions in Gulf of Mexico Common Bottlenose Dolphins (Tursiops truncatus) Found Dead following the Deepwater Horizon Oil Spill. *PLoS ONE* 10, e0126538 (2015) (discussing harmful impacts to marine mammals from oil spills).
[159] Montevecchi, W. 2005. Influences of artificial light on marine birds. In C. Rich and T. Longcore, editors. *Ecological Consequences of Artificial Night Lighting*. Washington, D.C: Island Press, 94-113.
[160] Wiese, F. K., W. A. Montevecchi, G. K. Davoren, F. Huettmann, A. W. Diamond, and J. Linke. 2001. Seabirds at risk around offshore oil platforms in the North-west Atlantic. *Marine Pollution Bulletin* 42:1285-1290.
[161] Wiese et al. 2001; Black, A. 2005. Light induced seabird mortality on vessels operating in the Southern Ocean: incidents and mitigation measures. *Antarctic Science* 17:67-68.; Le Corre, M., A. Ollivier, S. Ribes, and P. Jouventin. 2002. Light-induced mortality of petrels: a 4-year study from Réunion Island (Indian Ocean). *Biological Conservation* 105:93-102.
[162] *Id.* at 4-159.
[163] Draft EIS at 3-303.

fails to account for how exposure to oil and gas activities across multiple planning areas could impact the species. Such failure violates NEPA.

C. BOEM Failed To Take a Hard Look at the Impacts of Air and Water Pollution

BOEM's Draft EIS fails to take a hard look at the impacts of air and water pollution. BOEM admits that activities conducted pursuant to Lease Sale 244, such as exploratory drilling, production drilling, and vessel support activities, will cause water and air pollution. Air emissions include NOx, SOx, PM_{10} and $PM_{2.5}$, VOCs, carbon monoxide, and lead;[164] water discharges include deck drainage, human waste, bilge water contaminated with oil, and produced water from exploratory drilling activities, which can contain arsenic, lead and radioactive materials.[165]

However, BOEM largely ignores the impacts to water quality, marine life, and public health and welfare that will result from such pollution—including failing to quantify the impacts on public health—because wastewater discharges and air emissions are regulated by the Clean Water Act and Clean Air Act, respectively. But NEPA clearly obligates the Bureaus to look at *all* environmental impacts, and an agency cannot excuse itself from its NEPA hard look duty because a "facility operates pursuant to a . . . permit. . ." or because the impacts have been discussed in a non-NEPA document.[166] BOEM's failure to take a hard look at the air and water quality impacts on this basis clearly violates NEPA.

D. BOEM Failed To Take a Hard Look at the Impacts of Oil Spills and other Accidents

In its Draft EIS, BOEM acknowledges that 450 small spills would occur over the life of the activities conducted pursuant to Lease Sale 244,[167] but fails to adequately consider the direct, indirect, and cumulative impacts of large and very large spills because it deems them unlikely. But available information indicates that there is a significant risk of large oil spills; thus BOEM cannot discount the risks. For this same reason, catastrophic spills should be considered as part of the proposed action.

i. BOEM Must Analyze the Impacts of a Catastrophic Spill as Part of the Proposed Action

Offshore oil and gas development consistently results in both chronic and disaster-related oil spills. For example, in 1979, an exploratory well in the Gulf of Mexico blew out and spilled 140 million gallons of oil over the course of 10 months. In 1989, the Exxon Valdese spilled more than 11 million gallons of oil into Alaska's Prince William Sound. In 2004, Hurricane Ivan hit the Gulf of Mexico off the coast of Louisiana toppling an offshore well platform owned by Taylor Energy, which has been leaking gallons upon gallons of oil every day for over a decade, and recent reports indicate a dramatic spike in the size of oil sheens and the volume of spilled oil

[164] Draft EIS at 4-23.
[165] *Id.* at 4-7.
[166] *S. Fork Band of W. Shoshone v. U.S. Dep't of Interior*, 588 F.3d 718, 726 (9th Cir. 2009).
[167] *See e.g.*, Draft EIS at 4-18.

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since September, 2014.[168] In 2009, the Montara oil rig spilled between 29,600 and 222,000 barrels of oil into the Timor Sea over the span of ten weeks. In 2010, BP's *Deepwater Horizon* rig exploded, causing estimated 206 million gallons of oil to spill into the Gulf of Mexico over the course of almost three months.

These spills cause irreversible damage to marine and coastal environments, and the destructive impacts of large spills are immediate and severe. Oil spills and cleanup efforts are not just deadly to marine life, but also disruptive to ship traffic and detrimental to impacted shorelines, subsistence activities, commercial and recreational fishing, tourism, and the health of people living along the coast and people involved in clean-up efforts.

Nevertheless, BOEM largely dismisses the impacts of a catastrophic oil spill because oil and gas activities are regulated and changes have been implemented since the Deepwater Horizon disaster. But this self-serving assumption contradicts several federal studies published since the disaster finding that sufficient regulatory changes are still lacking. For example, a recent government report issued by the U.S. Chemical Safety and Hazard Investigation Board found that the causes of the Deepwater Horizon oil spill still have not been fully addressed, leading to the distinct risk that another catastrophic spill will occur.[169] Another recent report from the U.S. Government Accountability Office found that BSEE, BOEM's sister agency, "has not fully addressed deficiencies in its investigative, environmental compliance, and enforcement capabilities identified by investigations after the Deepwater Horizon incident."[170] It concludes that "BSEE continues to face deficiencies in each of these capabilities that undermine its ability to effectively oversee offshore oil and gas development."[171] BOEM must therefore analyze the impacts of a catastrophic oil spill as part of the proposed action.

ii. BOEM Failed To Adequately Consider the Risks of Large Oil Spills

BOEM also dismisses the import of large oil spills as unlikely. However, drilling for and transporting oil and gas is inherently dangerous and spills occur as a matter of course in offshore oil and gas operations. BOEM must give consideration of impacts from such spills proper weight.

BOEM's Draft EIS states that much of the oil will be transported via pipeline.[172] A review of records of the federal Pipeline and Hazardous Materials Safety Administration, which maintains a database of all U.S. pipelines, demonstrates that transport of oil and gas carries a significant risk of environmental and public safety impacts. Nationally, there were nearly 8,000

[168] Zoe Schlanger, Newsweek, *Oil Spill You've Never Heard of Has Been Leaking into Gulf of Mexico For a Decade* (Apr. 18, 2015), http://www newsweek.com/oil-spill-youve-never-heard-has-been-leaking-gulf-decade-20-times-larger-323373.
[169] Clifford Krauss, *Fixes After BP Spill Not Enough, Board Says*, New York Times at B2 (June 6, 2014), http://www nytimes.com/2014/06/06/business/energy-environment/fixes-after-bp-spill-not-enough-board-says.html?_r=0.
[170] U.S. GAO, Report: Interior's Bureau of Safety and Environmental Enforcement Restructuring Has Not Addressed Long-Standing Oversight Deficiencies (Feb. 2016), *available at* http://www.gao.gov/assets/680/675099.pdf.
[171] *Id.* at 28.
[172] Draft EIS at 2-16.

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significant incidents with U.S. pipelines, involving death, injury, and economic and environmental damage between 1986 and 2013—more than 300 per year.[173] Incidents classified as "significant" are those resulting in death or injury, had damages more than $50,000, spilled more than five barrels of highly volatile substances or 50 barrels of other liquid, or where the liquid exploded or burned.[174] And spills regularly occur in Alaska—for example, one of Hilcorp's onshore pipelines recently leaked nearly 4,000 gallons of crude;[175] in 2006 a pipeline owned by that leaked over 212,000 gallons over the course of five days in Prudhoe Bay;[176] and in 2010 the Trans-Alaska Pipeline spilled several thousand gallons of crude oil and closed the 800 mile pipeline.[177]

In fact, the U.S. Department of Transportation found that offshore pipelines can be more vulnerable than onshore pipelines. They have a greater vulnerability to severe weather conditions than onshore pipelines, especially during hurricane events. And massive wave action can alter the pipeline stability, causing gradual displacement, especially in small diameter pipelines.[178] Offshore pipelines can also face more corrosion than onshore pipelines due to higher temperature and pressure conditions that occur during the laying of these pipelines.[179]

In addition, aging poses risks of corrosion, erosion and fatigue stress to subsea pipelines.[180] Subsea pipeline corrosion appears to accelerate over time,[181] and can act synergistically with fatigue stress to increase the rate of crack propagation.[182] Marine environments are especially known to produce significant corrosion on steel surfaces, and when a steel structure is at or beyond its elastic limit, the rate of corrosion increases 10-15 percent.[183] One offshore pipeline study found that after 20 years the annual probability of pipeline failure increases rapidly, with values in the range of 0.1 to 1.0, which equates to a probability of failure

[173] The Center, *America's Dangerous Pipelines*, http://www.biologicaldiversity.org/campaigns/americas_dangerous_pipelines/.
[174] *Id.*
[175] Chris Klint, DEC, authorities addressing 4,000-gallon Hilcorp pipeline spill, Mar. 1, 2015, http://m ktuu.com/news/dec-authorities-addressing-4000gallon-hilcorp-pipeline-spill/31558574.
[176] ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION Division of Spill Prevention and Response Prevention and Emergency Response Program SITUATION REPORT, Mar. 25, 2008, http://dec.alaska.gov/spar/ppr/response/sum fy06/060302301/sitreps/060302301_sr_23.pdf.
[177] Bill Rigby, BP-owned Alaska oil pipeline shut after spill, Reuters, May 25, 2010, http://www reuters.com/article/2010/05/26/alaska-spill-idUSN2514942320100526?type=marketsNews#BJr3Y8WdhlJ51bQB.97.
[178] U.S. Department of Transportation: Federal Highway Administration. Impacts of Climate Change and Variability on Transportation Systems and Infrastructure: The Gulf Coast Study, Phase 2. 2015.
[179] Keuter, J. (2014). In-line Inspection of Pipes Using Corrosion Resistant Alloys (CRA). Rosen Technology and Research Center GmbH, Rosen Group, Germany; Standard Oil Company (1981) Drilling fluid bypass for marine riser. U.S. Grant. US4291772 A.
[180] Petroleum Safety Authority Norway. 2006. Material Risk – Ageing offshore installations. Prepared by Det Norske Veritas on request from Petroleum Safety Authority Norway, www.psa.no/report-archive/category1033 html.
[181] Mohd, M.H. and J.K. Paik. 2013. Investigation of the corrosion progress characteristics offshore oil well tubes. Corrosion Science 67:130-141.
[182] PSA Norway 2006.
[183] Mohd, M.H. and J.K. Paik (2013) Investigation of the corrosion progress characteristics of offshore subsea oil well tubes. Corrosion Science 67: 130-141; A. Igor, R.E. Melchers, Pitting corrosion in pipeline steel weld zones, Corros. Sci. 53 (12) (2011) 4026–4032; R.E. Melchers, M. Ahammed, R. Jeffrey, G. Simundic, Statistical characterization of surfaces of corroded steel plates, Mar. Struct. 23 (2010) 274–287.

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of 10 percent to 100 percent per year.[184] Another study covering 1996-2010 found that accident incident rates, including spills, increased significantly with the age of infrastructure.[185]

Consistent with these findings, a report published in 2010 found that the number of oil spills from offshore rigs and pipelines between 2000 and 2009 *more than quadrupled* the rate of spills in prior decades.[186] In particular, from the early 1970s through the 1990s, offshore rigs and pipelines averaged about four spills per year of at least 2,100 gallons. The average annual total skyrocketed to more than 17 from 2000 to 2009, and averaged 22 per year from 2005 to 2009 alone.[187] And the number of spills, as well as the quantity of spilled oil, grew significantly worse even when taking increased production in account.[188]

Federal data show that new pipelines also carry a high risk of spills, mostly because of faulty design or construction.[189] These data indicate there are more oil spills in the first two years of pipeline's life than in the next seven years combined.[190] This is a significant concern given that BOEM estimates the lease sale will require the installation of new offshore pipelines.[191] BOEM must therefore conduct a more thorough analysis of the risks and effects of oil spills as the result of Lease Sale 244.

IV. BOEM Failed To Consider an Adequate Range of Reasonable Alternatives and Failed To Properly Consider the No-Action Alternative

NEPA requires a "detailed statement" of "alternatives to the proposed action."[192] The purpose of this section is "to insist that no major federal project should be undertaken without intense consideration of other more ecologically sound courses of action, including shelving the entire project, or of accomplishing the same result by entirely different means."[193] In this way, the alternatives analysis is the "heart of the environmental impact statement."[194] But BOEM's Draft EIS wholly fails to analyze a reasonable range of alternatives, and fails to properly consider the no-action alternative.

[184] Bea, R., C. Smith, B. Smith, J. Rosenmoeller, T. Beuker, and B. Brown. 2002. Real-time Reliability Assessment & Management of Marine Pipelines. 21st International Conference on Offshore Mechanics & Arctic Engineering. ASME.
[185] Muehlenbachs, et al. 2013. The impact of water depth on safety and environmental performance in offshore oil and gas production. Energy Policy 55:699-705.
[186] Alan Levin, Oil Spills Escalated in this Decade, USA Today, June 8, 2010, available at http://usatoday30.usatoday.com/news/nation/2010-06-07-oil-spill-mess_N htm.
[187] *Id.*
[188] *Id.*
[189] Richard Stover, PhD, *Review of the US Department of Transportation Report The State of the National Pipeline Infrastructure*, Aug. 2013, *available at* http://www.icogitate.com/~oildrop/PHMSA_report_analysis.pdf.
[190] *Id.*
[191] Draft EIS at 2-27.
[192] 42 U.S.C. § 4332(2)(c).
[193] *Environmental Defense Fund v. Corps of Engineers*, 492 F.2d 1123, 1135 (5th Cir. 1974).
[194] 40 C.F.R. § 1502.14.

A. BOEM Failed To Consider a Reasonable Range of Alternatives

In the alternatives analysis, an agency must "provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact."[195] The analysis must "rigorously explore and objectively evaluate all reasonable alternatives."[196] While an agency is not obliged to consider every alternative to every aspect of a proposed action, the agency must "consider such alternatives to the proposed action as may partially or completely meet the proposals goal."[197]

In its Draft EIS, BOEM considered six primary alternatives: (1) offering for lease 224 OCS blocs in federal waters in Cook Inlet (the proposed action/preferred alternative); (2) no lease sale (the purported no-action alternative); (3)(A) beluga whale critical habitat exclusion; (3)(B) beluga whale critical habitat mitigation; (3)(C) beluga whale nearshore feeding area mitigation; (4)(A) northern sea otter critical habitat exclusion; (4)(B) northern sea otter critical habitat mitigation; (5) gillnet fishery mitigation; and (6) prohibition of drilling discharges. In considering only these alternatives, BOEM failed to "rigorously explore" and "objectively evaluate" all reasonable alternatives. Indeed, in its cumulative impacts analysis, BOEM states that the cumulative impacts of each action alternative would be similar "because all of the alternatives are presumed to entail the same amount of oil and gas activity,"[198] suggesting that the action alternatives are not really alternatives at all.

For example, BOEM failed to consider an alternative that would end all new offshore oil and gas leasing pending a plan to limit warming to 1.5º or 2ºC. BOEM's failure to consider such an alternative is particularly troubling considering recent reports finding that ending new offshore leases will lead to reductions in global greenhouse gas emissions[199] and that BOEM has already leased over 20 million acres of the OCS to oil companies. And many of these leases are relatively new leases, meaning that, by BOEM's own admission, activities under these leases will last at least from 40 to 70 years. BOEM's analysis wholly fails to consider why OCS areas already under lease—many of which are inactive—are not sufficient to supply the nation's energy needs while we transition away from dirty fossil fuels and toward clean energy.[200]

And despite acknowledging multiple renewable energy projects in Cook Inlet, including offshore wind and tidal energy,[201] BOEM failed to consider an alternative whereby the OCS area to be leased for oil and gas development would instead be leased for renewable energy.

And even if BOEM properly limited its purpose and need statement (which it did not), BOEM unreasonably ruled out alternatives that would restrict oil and gas development, even if they would have met the "need" of holding Lease Sale 244 to further the development of OCS

[195] *Id.* § 1508.9.
[196] *Id.* § 1502.14.
[197] *Nat. Resources Defense Council, Inc. v. Callaway*, 524 F 2d. 79, 93 (2d Cir. 1975).
[198] Draft EIS at 5-1.
[199] Stockholm Environment Institute, *supra* n. 27.
[200] U.S. Department of the Interior, "Oil and Gas Utilization, Onshore and Offshore: Updated Report to the President" (May 2012), *available at* https://www.doi.gov/sites/doi.gov/files/migrated/news/pressreleases/upload/Final-Report.pdf
[201] *See e.g.*, Draft EIS at 5-3.

oil and gas resources. For example, BOEM failed to consider an alternative that would exclude critical habitat areas for *both* Cook Inlet beluga whales and Northern sea otters, rather than just one or the other. BOEM also failed to consider an alternative that would delay Lease Sale 244 until more information is known about the threats to beluga whales or restrict activities to south of Anchor Point to better protect belugas, as suggested by the Marine Mammal Commission.[202] BOEM also failed to consider an alternative that would prohibit any exploration or drilling activities from June to September—when the waters outside Cook Inlet in the Gulf of Alaska are designated as biologically important areas for North Pacific right whales.[203]

Moreover, BOEM failed to examine alternatives that would otherwise limit development and production activities, such as an alternative that would limit the number of production wells that could be drilled under its proposal; or an alternative that would prohibit the use of particularly dangerous drilling activities, such as offshore fracking and acidizing. BOEMS's failure to consider these alternatives violates NEPA.

B. BOEM's Analysis of the "No-Action" Alternative Is Inadequate

NEPA requires every EIS to have a no-action alternative so the public and policy makers can fully understand the environmental consequences of the agency's decision as compared to the status quo.[204] But BOEM's analysis of Alternative E—the "no-action" alternative—is inadequate. BOEM illogically concludes that the no-action alternative would have essentially the same or more negative impacts than all of the action alternatives. To reach this conclusion, BOEM assumes that the nation will conduct business as usual for the next 40-years—in other words, that future energy needs will mirror historical energy trends.[205] Accordingly, the oil and gas that would have been extracted under Lease Sale 244 would be substituted by oil, gas, or other fuels obtained onshore or through imports which create risk of harm to the environment and public health.[206]

But it is wholly unreasonable to assume that laws in place prior to the start of activities conducted under Lease Sale 244 will govern through the next four decades, particularly considering that the United States has committed to limit global warming to 1.5ºC or 2ºC above pre-industrial levels consistent with the Paris Agreement. And this analysis also ignores new reports (noted above) that show that leaving federal fossil fuels in the ground can reduce oil consumption and greenhouse-gas emissions at the global level.[207]

Furthermore, BOEM Draft EIS repeatedly states that the no action alternative means that the lease would not occur now, but could occur in the future.[208] Thus, according to BOEM, the no-action alternative encompasses the same potential impacts as a decision to hold the lease sale;

[202] Comments from Rebecca Lent, Executive Director, Marine Mammal Commission, to Michael Rolland, BOEM (December 8, 2014), available at http://www.mmc.gov/wp-content/uploads/EIS_CookInletLeas_120814.pdf.
[203] NMFS, Cetacean & Sound Mapping, http://cetsound.noaa.gov/biologically-important-area-map.
[204] 40 C.F.R. § 1502.14(d); *Ctr. for Biological Div. U.S. Dep't of the Interior*, 623 F.3d 633, 642 (9th Cir. 2010).
[205] Draft EIS at 4-231.
[206] *Id.*.
[207] Stockholm Environment Institute, *supra* n. 27.
[208] *See e.g.*, Draft EIS at 2-43; 2-51; 4-231.

those impacts would just be delayed. But this approach "avoid[s] the task actually facing [BOEM]. In assuming that, no matter what, the proposed activities would surely occur, [BOEM is] neglecting to consider what would be a true 'no action' alternative."[209] BOEM's analysis of the "no-action" alternative is therefore improper.

V. BOEM Failed To Adequately Consider Cumulative Impacts

In evaluating the environmental impact of the proposed action, NEPA requires BOEM to consider and describe the direct, indirect, and cumulative impacts.[210] Cumulative impacts are those impacts that "result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."[211] BOEM's Draft EIS fails to adequately consider the cumulative impacts of its proposal to adopt the preferred alternative and auction off yet more of our oceans to oil companies.

BOEM's Draft EIS expressly states that it is *not* considering the impacts of climate change from the consumption of oil and gas to be extracted under Lease Sale 244 because, according to BOEM, analyzing such impacts is too uncertain and adequate tools to calculate such impacts do not exist.[212] However, as explained above, there are numerous tools available to BOEM that can inform such analysis, many of which CEQ has specifically recommended agencies employ when analyzing actions with climate change impacts.[213]

BOEM's Draft EIS also fails to properly address the greenhouse gas emissions that will be directly emitted as the result of Lease Sale 244, such as through support vessels and drilling activities. In particular, BOEM dismisses the cumulative impacts of these greenhouse gas emissions "because of the scale of the proposed action when compared to climate change."[214] This misses the entire point of a cumulative impacts analysis. Cumulative impacts, by definition, may be relatively minor when viewed in isolation yet significant in combination.[215] It is the combined effect that BOEM is required to analyze, not the comparative effect. BOEM's analysis of the cumulative impacts of noise on marine mammals is inadequate for the same reason.[216]

BOEM's cumulative impacts analysis also fails to adequately consider several other cumulative impacts, including the impacts of routine oil spills on the marine environment. By BOEM's own estimation, there will be 450 small spills of up to 999 barrels over the 40-years of oil and gas activities under Lease Sale 244, the majority of which would occur during the

[209] *Conservation Council of Hawaii v. NMFS*, 97 F. Supp. 3d 1210, 1236 (D. Haw. 2015).
[210] 40 C.F.R §§ 1502.16, 1508.7, 1508.8; *Northern Plains Resource Council v. Surface Transportation Board*, 668 F.3d 1067, 1072-73 (9th Cir. 2011).
[211] 40 C.F.R. § 1508.7.
[212] Draft EIS at 5-30.
[213] *See e.g.*, 81 Fed. Reg. 51,866 (Aug. 5, 2016); Final Guidance at 16 (citations omitted); CEQ, Greenhouse Gas Accounting Tools, https://ceq.doe.gov/current_developments/GHG-accounting-tools.html.
[214] Draft EIS at 5-45.
[215] 40 C.F.R. § 1508.7.
[216] *See* Draft EIS at 5-45 (indicating that cumulative effects of noise on marine mammals is not significant given current noise levels in the Inlet).

development and production phase, for an average of 13 spills per year.[217] In other words, BOEM assumes there could be nearly 13,000 barrels (or 545,454 gallons) spill into the Inlet each year. This could cause significant harm to marine species in the Inlet.

For example, sea otters are particularly vulnerable to contamination from oil spills. When sea otters come into contact with oil, it causes their fur to mat, which prevents the fur from insulating their bodies. Without this natural protection from the cold water temperature, sea otters can quickly die from hypothermia; the toxicity of oil can also be harmful to sea otters, causing liver and kidney failure and damage to their lungs and eyes.[218] And exposure to crude oil adversely affects fish at all stages,[219] and has been linked to long-term population effects. A recent study based on 25 years of research demonstrated that embryonic salmon and herring exposed to very low levels of crude oil can develop heart defects that impede their later survival, indicating that the spill may have had much more widespread impacts than previously thought.[220] This could, in turn, have significant harmful impacts on commercial, recreational, and subsistence fishing. But BOEM failed to properly consider the cumulative impacts of such spills.

VI. BOEM Failed To Adequately Consider Environmental Justice Issues and Failed To Quantify the Social and Environmental Costs of its Proposal

From air pollution to subsistence hunting and fishing, BOEM's proposal raises significant environmental justice issues. But BOEM's Draft EIS fails to adequately address these significant impacts.

As BOEM is well aware, on February 11, 1994, President Clinton issued Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations." The Executive Order makes it the responsibility of each Federal agency to "make achieving environmental justice part of its mission in identify and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations." Accompanying this order was a Presidential Memorandum stating that "each Federal agency shall analyze the environmental effects, including human health, economic and social effects, of Federal actions, including effects on minority communities and low-income communities, when such analysis is required by [NEPA]." The CEQ has also issued guidance on incorporating environmental justice considerations in the NEPA process.[221] The guidance states in part:

[217] *See e.g.*, Draft EIS at 4-18.
[218] USFWS, Southern Sea Otter (*Enhydra lutris nereis*) 5-Year Review: Summary and Evaluation, Sept. 15, 2015.
[219] Carls, M. G., S. D. Rice, and J. E. Hose. 1999. Sensitivity of fish embryos to weathered crude oil: part I. Low-level exposure during incubation causes malformations, genetic damage, and mortality in larval pacific herring (Clupea pallasi). Environmental Toxicology and Chemistry 18:481-493; Bernanke, J., and H.-R. Kohler. 2009. The impact of environmental chemicals on wildlife vertebrates. Reviews of Environmental Contamination and Toxicology 198:1-47..
[220] Incardona, et al. 2015. Very low embryonic crude oil exposures cause lasting cardiac defects in salmon and herring. Scientific Reports 5, Article number: 13499, doi:10.1038/srep13499.
[221] CEQ, Environmental Justice: Guidance Under the National Environmental Policy Act, http://energy.gov/sites/prod/files/nepapub/nepa_documents/RedDont/G-CEQ-EJGuidance.pdf.

> Early and meaningful public participation in the federal agency decision making process is a paramount goal of NEPA. CEQ's regulations require agencies to make diligent efforts to involve the public throughout the NEPA process. Participation of low-income populations, minority populations, or tribal populations may require adaptive or innovative approaches to overcome linguistic, institutional, cultural, economic, historical, or other potential barriers to effective participation in the decision-making processes of Federal agencies under customary NEPA procedures.[222]

BOEM's actions to date, including the failure to quantify or analyze the impacts of air pollution and greenhouse gas emissions described above, undercut efforts to inform and engage environmental justice communities. The Cook Inlet area is home to a variety of onshore oil and gas infrastructure that support offshore oil and gas drilling activities, including oil refineries. Toxic pollution from these refineries can disproportionately impact low-income neighborhoods and Native Alaskans.

Offshore drilling in Alaska also disproportionately impacts Native Alaskan communities who rely on species for subsistence hunting and fishing that are threatened by noise, oil spills, and melting sea ice. Moreover, many of these communities are also on the frontlines of climate change, with one village recently choosing to leave its ancestoral lands and relocate the entire village because of erosion and flooding attributed to climate change.[223] Indeed, 31 villages in Alaska face "imminent threat of destruction" from erosion and flooding.[224]

BOEM's proposal will exacerbate all these impacts by leading to more oil drilling, which will lead to more oil refining, toxic air pollution, and greenhouse gas emissions. While BOEM quantifies the purported economic benefits of its proposal, such as job creation and value added impacts,[225] BOEM wholly fails to quantify the negative impacts that would result, such as the quantity of air pollutants from refining and consuming the oil and gas to be extracted, and the attendant societal and environmental costs of such emissions. Moreover, while BOEM admits the air pollutants to be emitted during exploration and production activities can increase respiratory- and cardiovascular-related hospital visits and incidents of bronchitis,[226] BOEM wholly fails to quantify these impacts.

This is despite BOEM's prior quantification of harm caused by air emissions from oil and gas activities represented by dollars per ton for certain pollutants,[227] and a readily available tool

[222] *Id.* at 13.
[223] Christopher Mele and Daniel Victor, *Reeling From Effects of Climate Change, Alaskan Village Votes to Relocate*, New York Times, Aug. 19, 2016, http://www.nytimes.com/2016/08/20/us/shishmaref-alaska-elocate-vote-climate-change.html?_r=0.
[224] *Id.*
[225] *See e.g.*, Draft EIS at Appendix E.
[226] Draft EIS at 5-65.
[227] *See e.g.*, Draft Proposed Program at B-8 (referencing OECM which quantifies the economic cost of air pollutants, including NOx, SOx, PM10 and PM2.5, carbon monoxide, and VOCs); Industrial Economics, Inc.; Applied Science Associates, Inc.; Northern Economics; and Dr. Nicholas Z. Muller. 2012. Forecasting Environmental and Social

to analyze the costs of the greenhouse gas emissions generated by BOEM's proposal—the social cost of carbon. The social cost of carbon was developed by the Interagency Working Group on Social Cost of Carbon, which was convened by the Council of Economic Advisers and the Office of Management and Budget. As explained in the Working Group's report:

> The purpose of the "social cost of carbon" (SCC) estimates presented here is to allow agencies to incorporate the social benefits of reducing carbon dioxide (CO_2) emissions into cost-benefit analyses of regulatory actions that impact cumulative global emissions. The SCC is an estimate of the monetized damages associated with an incremental increase in carbon emissions in a given year. It is intended to include (but is not limited to) changes in net agricultural productivity, human health, property damages from increased flood risk, and the value of ecosystem services due to climate change.[228]

The working group presents values for social costs from 2015 to 2050, ranging from $11 to $212 (in 2007 dollars per metric ton of CO_2).[229] The SCC demonstrates that the benefits of reducing carbon pollution are significant. For example, the proposed rules for reducing power plant carbon emissions calculated the climate benefits and health co-benefits to be $15.6 to $88 billion in 2020 and $32.3 to $151 billion in 2030.[230] However, recent studies have demonstrated that the numeric value assigned to the social cost of carbon vastly underestimates the true cost.[231] The social cost of carbon is therefore a minimum value.

Other analytical tools exist to evaluate the cost of methane emissions.[232] The U.S. Environmental Protection Agency has peer-reviewed and employed such a tool in its "Regulatory Impact Analysis of the Proposed Emission Standards for New and Modified Sources in the Oil and Natural Gas Sector."[233]

BOEM's quantification of the purported economic benefits of its proposal while assigning zero value to the social and environmental costs is both disingenuous and unlawful

Externalities Associated with OCS Oil and Gas Development: The Revised Offshore Environmental Cost Model (OECM) (BOEM 2012-025).
[228] Interagency Working Group on Social Cost of Carbon, United States Government, Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis - Under Executive Order 12866, May 2013, *available at* https://www.whitehouse.gov/sites/default/files/omb/inforeg/social_cost_of_carbon_for_ria_2013_update.pdf.
[229] Interagency Working Group on Social Cost of Carbon, United States Government, Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866 at 2-3 (July 2015 revision), https://www.whitehouse.gov/sites/default/files/omb/inforeg/scc-tsd-final-july-2015.pdf.
[230] EPA, Regulatory Impact Analysis Technical Document EPA-452/R-14-002 (June 2014).
[231] F. Ackerman & E. Stanton, Climate Risks and Carbon Prices: Revising the Social Cost of Carbon, in Economics, vol. 6 (Apr. 4, 2012) (the social cost of carbon could be almost $900/tCO2 in 2010, rising to $1,500/tCO2 in 2050).
[232] Marten A.L., Kopits K.A., Griffiths C.W., Newbold S.C., Wolverton A. 2015. "Incremental CH4 and N2O mitigation benefits consistent with the US Government's SC-CO2 estimates," Climate Policy 15(2):272-298.
[233] USEPA, Social Cost of Carbon, *available at* http://www3.epa.gov/climatechange/EPAactivities/economics/scc html (noting application of social cost of methane supported by peer review); USEPA, Regulatory Impact Analysis of the Proposed Emission Standards for New and Modified Sources in the Oil and Natural Gas Sector, Ch. 4, available at http://www3.epa.gov/airquality/oilandgas/pdfs/og_prop_ria_081815.pdf.

under NEPA. Moreover, its failure to adequately describe and quantify these negative impacts does not comply with its duty to disclose the environmental justice implications.

BOEM's analysis of the cumulative impacts of its proposal on environmental justice communities is inadequate for the same reason. Indeed, BOEM seems to dismiss the import of the additional air pollution that could result from its proposal because there is already significant oil and gas-related infrastructure in Alaska and the Cook Inlet region. This approach undercuts the entire purpose of a cumulative impacts analysis and efforts to inform and engage environmental justice communities.

VII. BOEM Must Engage in Comprehensive Section 7 Consultation under the ESA Prior To Holding Lease Sale 244

BOEM cannot hold Lease Sale 244 unless and until comprehensive consultation under Section 7 of the ESA is completed. In enacting the ESA, Congress recognized that certain species "have been so depleted in numbers that they are in danger of or threatened with extinction."[234] Accordingly, a primary purpose of the ESA is "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, [and] to provide a program for the conservation of such . . . species."[235]

To reach these goals, Section 9 of the ESA prohibits any person, including any federal agency, from "taking" any endangered species without proper authorization through a valid incidental take permit.[236] The term "take" is statutorily defined broadly as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct."[237] The definition of "harm" has been defined broadly by regulation as "an act which actually kills or injures wildlife. Such act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering."[238] Courts have found federal agencies liable for take of listed species where agency authorized activities resulted in the killing or harming of ESA-listed species.[239]

Additionally, Section 7(a)(2) of the ESA requires federal agencies to "insure that any action authorized, funded, or carried out by such agency . . . is not likely to jeopardize the continued existence of any endangered species or result in the destruction or adverse modification of [the critical] habitat of such species."[240] "Action" is broadly defined to include "all activities or programs of any kind authorized, funded, or carried out, in whole or in part" by

[234]16 U.S.C. § 1531(a)(2).
[235] *Id.* § 1531(b).
[236] 16 U.S.C. § 1538(a)(1)(B); *see also* 50 C.F.R. § 17.31(a) (extending the "take" prohibition to threatened species managed by the U.S. Fish and Wildlife Service)..
[237] 16 U.S.C. § 1532(19).
[238] 50 C.F.R. § 17.3; *see also Babbitt v. Sweet Home Ch. Of Communities for a Great Oregon*, 515 U.S. 687 (1995) (upholding regulatory definition of harm).
[239] *See e.g., Defenders of Wildlife v. Envtl. Prot. Agency*, 882 F.2d 1294, 1300-01 (8th Cir. 1989); *Strahan v. Coxe*, 127 F.3d 155, 163 (1st Cir. 1997).
[240] 16 U.S.C. § 1536(a)(2); 50 C.F.R. § 402.14(a).

federal agencies and include granting permits and licenses, as well as actions that may directly or indirectly cause modifications to the land, water, or air.[241]

To facilitate compliance with Section 7(a)(2), an "agency shall . . . request" from the Services information regarding whether any listed species "may be present" in a proposed action area, and if so, the "agency shall conduct a biological assessment" to identify species likely to be affected.[242] The agency must then initiate formal consultation with the Services if a proposed action "may affect" any of those listed species.[243]

After formal consultation, the Services issue a biological opinion to determine whether the agency action is likely to "jeopardize" any species' existence. If so, the opinion may specify reasonable and prudent alternatives ("RPAs") that avoid jeopardy.[244] If the Services conclude that the action or the RPAs will not cause jeopardy, the Services will issue an incidental take statement ("ITS") that specifies "the impact, i.e., the amount or extent, of . . . incidental taking" that may occur.[245] When those listed species are marine mammals, the take must first be authorized pursuant to the MMPA, and the ITS must include any additional measures necessary to comply with the MMPA take authorization. *Id*. The take of a listed species in compliance with the terms of a valid ITS is not prohibited under Section 9 of the ESA.[246]

BOEM's Draft EIS admits that Lease Sale 244 will affect threatened and endangered species and their critical habitats through all stages of exploration, development, and production. Yet BOEM states that is only engaging in formal Section 7 consultation for activities conducted during the early lease-sale stages—seismic surveying, ancillary activities, and exploration drilling.[247] But BOEM's analysis specifically estimates the number of development and production wells to be drilled, the amount of oil and gas to be extracted, and the timeline of these activities. As such, BOEM should conduct comprehensive Section 7 consultation that analyzes *all* activities conducted because of Lease Sale 244, including the effects of increased greenhouse gas emissions on listed species. Failure to do so would improperly truncate the agency action under review.

VIII. Conclusion

In sum, Cook Inlet Lease Sale 244 would cause a wide variety of serious harms to the environment, including greenhouse gas emissions that will exacerbate climate change, oil spills, and further impacts to already imperiled wildlife and local communities, many of which are already suffering the impacts of climate change. Accordingly, the Center urges BOEM to adopt the no-action alternative, cancel Lease Sale 244, and keep dirty fossil fuels in the ground.

[241] 50 C.F.R. § 402.02.
[242] 16 U.S.C. § 1536(c).
[243] . 50 C.F.R. § 402.14(a); 51 Fed. Reg. 19,926 (June 3, 1986) ("may affect" broadly includes "[a]ny possible effect, whether beneficial, benign, adverse or of an undetermined character").
[244] 16 U.S.C. § 1536(b); 50 C.F.R. § 402.14(h)(3).
[245] 50 C.F.R. § 402.14(h)(3).
[246] 16 U.S.C. §§ 1536(b)(4), (o)(2); 50 C.F.R. § 402.14(i)(5).
[247] Draft EIS at 6-3.

If BOEM nevertheless decides to proceed with Lease Sale 244, BOEM must first address and remedy the numerous deficiencies within the Draft EIS and must circulate a revised Draft EIS for public comment. BOEM's new NEPA analysis must, among other revisions, take the requisite hard look at the impacts of Lease Sale 244 by quantifying and analyzing the greenhouse gas emissions that could result from the consumption of oil and gas extracted under the lease. It must also analyze a reasonable range of alternatives, including an alternative that considers halting all new offshore oil and gas leases to avoid the most catastrophic impacts of climate change. Moreover, BOEM cannot hold Lease Sale 244 unless and until comprehensive consultation under Section 7 of the ESA is completed.

Sincerely,

/s/ Kristen Monsell

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PUBLIC SUBMISSION

As of: September 07, 2016
Received: September 06, 2016
Status: Posted
Posted: September 07, 2016
Tracking No. 1k0-8rre-itoi
Comments Due: September 06, 2016
Submission Type: Web

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0092
Comment from Bob Shavelson, Cook Inletkeeper

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General Comment

Comments submitted by Cook Inletkeeper

Attachments

Inletkeeper LS244 Comments 20160906

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September 6, 2016

Abigail Ross-Hopper, Director
Bureau of Ocean Energy Management
1849 C Street, NW
Washington, D.C. 20240

Re: Lease Sale 244

Dear Director Ross-Hopper:

Please accept these comments on behalf of Cook Inletkeeper, a public interest organization formed by concerned Alaskans in 1995 to protect the Cook Inlet watershed and the life it sustains.

We've joined others in more detailed comments submitted on proposed Lease Sale 244, and would like to supplement the record with this additional information.

As a threshold matter, we're extremely disappointed in the Obama Administration's poor public process for this lease sale. For example, the NEPA scoping process was anemic and—to be perfectly frank—incompetent, with our organization and others receiving only a few hours' notice of the local scoping meeting. Then, at the public hearing in Homer on the draft EIS last month, BOEM flatly refused to answer any questions, instead hiding behind an obtuse and impersonal wall of federal laws and rules.

Next, your agency refused to grant Alaskans additional time to review the 600+ page DEIS, despite the fact BOEM announced the DEIS and the public comment period during the heart of the commercial, subsistence and personal use fishing seasons. Finally, you traveled from Washington, D.C. to Alaska during the public comment period for the Cook Inlet sale, yet you could only find time to meet with AOGA and the pro-oil side of the Alaska equation.

These process concerns reflect an ongoing and longstanding reluctance by BOEM and its predecessor to engage the people on the ground in Alaska who will be most affected by new exploration and development, and the risks they entail. This problem is exacerbated by OCSLA's regular and ongoing planning and leasing processes, which subject Cook Inlet residents

Protecting Alaska's Cook Inlet watershed and the life it sustains since 1995.

to a relentless, never-ending push to lease and development oil and gas in the waters that not only support our fishing and tourism economies, but also provide a quality of life unique in the world.

In fact, the relentless push to lease makes little sense economically, especially with current low oil and gas prices; although we are still waiting on FOIA information to understand exact federal expenditures, it's safe to say BOEM and MMS have spent tens of millions of dollars marshalling through Cook Inlet lease sales 191 (2004), 211 (2009), and 219 (2011), which resulted in no bids and no new leases. So, while groups such as the Resource Development Council in their recent comments on lease sale 244 say "BOEM should allow market dynamics to decide the fate of a future lease sale," we agree: after three lease sales in the past 12 years resulted in no bids, the Obama Administration should cut taxpayer losses, discontinue leasing for oil and gas, and move Alaska into the 21st century with more renewable energy leasing on the OCS.

As to the substance of the DEIS, it's incomprehensible in this day and age how or why BOEM refused to consider the end-product climate impacts from the sale, especially in light of the Obama Administration's lofty rhetoric and commitments around the Paris Climate Accords. In fact, Lease Sale 244 undermines the very commitments President Obama made in Paris.[1]

When Alaskans around Cook Inlet talk about climate change, it's not from some theoretical or esoteric perspective. Instead, we talk about the thousands of acres of dead and dying spruce trees all around us, infested by an aphid which is flourishing in our warmer temperature regime. We talk about mass die-offs of sea otters and common murres; we experience first-hand sea star wasting disease and never-before-seen incidences of toxic alga; we lament the fact we have had no real winter in three years; and we have years of data showing alarming warming trends in our cold-water salmon streams.

Just last week, Anchorage broke its record high temperature by 7 degrees F.[2]

As climate change wracks our shores on a daily basis, oil and gas development remains highly controversial. That's why it's so important for BOEM to engage Alaskans in an authentic discussion about renewable energy on the OCS. Cook Inlet boasts world-class renewable power supplies—from the second highest tides in North America to prolific wind and solar potential—and BOEM can help make Alaska a leader in renewable jobs and technologies.

But to do so will take commitment from you and others in the Obama Administration. Towards that end, we invite to come back to Alaska to talk with Alaskans about climate change and renewable energy. We'd welcome such a discussion, and we'd ensure it was positive and productive.

[1] See, e.g., https://www.sei-international.org/mediamanager/documents/Publications/Climate/SEI-PB-2016-US-fossilfuel-leases-climate.pdf
[2] http://www.adn.com/alaska-news/weather/2016/08/29/sundays-heat-blitzed-the-old-anchorage-temperature-record-for-the-date/

Thank you for considering these comments on behalf of Inletkeeper and its more than 2500 members and supporters around Cook Inlet. Please feel free to contact me if you have questions or would like to arrange a meeting at 907.299.3277 or bob@inletkeeper.org

Yours for Cook Inlet,

Bob Shavelson
Inletkeeper

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Industry Non-Governmental Organizations

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PUBLIC SUBMISSION

As of: August 23, 2016
Tracking No. 1k0-8rhu-7c8p
Comments Due: September 06, 2016

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0045
Comment from Carl Portman, Resource Development Council

Submitter Information

Name: Carl Portman
Organization: Resource Development Council

General Comment

See attached file(s)

Attachments

RDC Cook Inlet Lease Sale Comments

BOEM-2014-0001-0045.html[8/24/2016 9:50:21 AM]

RESOURCE DEVELOPMENT COUNCIL
Growing Alaska Through Responsible Resource Development

August 15, 2016

Dr. James Kendall
Alaska Regional Director, Alaska OCS Region
Bureau of Ocean Energy Management
3801 Centerpoint Drive, Suite 500
Anchorage, AK 99503-5823

Re: Cook Inlet Outer Continental Shelf Lease Sale 244

Dear Dr. Kendall:

The Resource Development Council for Alaska, Inc. (RDC) is writing to support proposed Lease Sale 244 in the Cook Inlet Outer Continental Shelf (OCS) Planning Area. The proposed lease sale is clearly in the best interest of Alaska and its residents.

RDC is an Alaskan business association comprised of individuals and companies from Alaska's oil and gas, mining, forest products, tourism, and fisheries industries. Our membership includes all of the Alaska Native Regional Corporations, local communities, organized labor, and industry support firms. RDC's purpose is to expand the state's economic base through the responsible development of our natural resources.

The proposed lease sale is located offshore in the northern portion of the federal waters of Cook Inlet. The area identified for the proposed lease sale is close to existing leases in Cook Inlet state waters, avoids nearly all of the areas designated as critical habitat for the beluga whale and the northern sea otter, avoids the critical habitat for the Steller sea lion, and excludes much of the subsistence-use area for Native villages.

The discovery of oil in the Cook Inlet region led to Alaska's statehood and has remained a vital resource for energy security for local residents. Federal waters in Cook Inlet offer significant potential for new natural gas reserves to meet future demand. Approximately 85 percent of the electricity generated in Southcentral Alaska relies on natural gas fired turbines, and approximately 60 percent of Alaskans rely on Cook Inlet natural gas as a source of heat or electricity for their homes and businesses.

Lease Sale 244 offers new opportunities for economic development and diversification along the southern reaches of the Kenai Peninsula. New oil and gas production would create hundreds of new direct and indirect jobs and boost tax revenues to local government. The oil and gas industry is a major component of the Southcentral Alaska economy, sustaining thousands of jobs and significant revenues which help fund local programs and services.

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Page 2/RDC comments on proposed Lease Sale 244, Cook Inlet, Alaska

Oil and gas development and production has coexisted with other industries, including fishing and tourism, for more than 50 years in Cook Inlet. Alaska has shown that oil and gas development and environmental protection are not mutually exclusive. Extensive monitoring programs and environmental studies conducted throughout the Cook Inlet basin over the last 50 years have found no evidence of adverse environmental impacts from oil and gas development. The industry's record clearly indicates it has the knowledge, experience and expertise to avoid impacts to sensitive areas. Spill prevention and response capabilities are a major part of industry plans and operations to protect sensitive areas and the rich fishery resources of Cook Inlet.

Although interest in exploration and development in Cook Inlet may be limited at this time, RDC urges the Bureau of Ocean Energy Management (BOEM) to proceed with Lease Sale 244. While industry investment has slowed due to low prices, no one can accurately predict what the price of oil and gas will be when the lease sale occurs. If there is no interest when the lease sale occurs, the federal government does not have to hold the sale. BOEM should allow market dynamics to decide the fate of a future lease sale.

Clearly, proposed Lease Sale 244 is in the best interest of the region, Alaska, and the nation. Moreover, a 2014 poll found that 73 percent of Alaskans support offshore development in the Alaska OCS, including Cook Inlet.

Thank you for the opportunity to comment on Lease Sale 244.

Sincerely,

Carl Portman
Deputy Director

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PUBLIC SUBMISSION

As of: September 07, 2016
Received: September 06, 2016
Status: Posted
Posted: September 07, 2016
Tracking No. 1k0-8rre-w0fq
Comments Due: September 06, 2016
Submission Type: Web

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0091
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General Comment

See attached file(s)

Attachments

NASCA Comments on BOEM Cook Inlet Oil and Gas Lease Sale 244

Before the
BUREAU OF OCEAN ENERGY MANAGEMENT
U.S. DEPARTMENT OF THE INTERIOR
Washington, D.C.

In the Matter of Draft Environmental Impact Statement for the Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244	BOEM 2014-0001

COMMENTS OF THE
NORTH AMERICAN SUBMARINE CABLE ASSOCIATION

The North American Submarine Cable Association ("NASCA") welcomes the Bureau of Ocean Energy Management ("BOEM")'s efforts to analyze the impact of oil and gas activities on submarine cable infrastructure in its draft Environmental Impact Statement for the Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244 (the "Draft EIS").[1] To ensure the protection of U.S. critical infrastructure, however, any environmental impact statement ("EIS") for federal action that facilitates the exploration, development, and production of offshore energy resources must identify all affected submarine cable systems comprehensively, and appraise the risks of damage to submarine cable systems accurately. Because the Draft EIS falls short in these respects, NASCA urges BOEM to correct the errors and omissions in its analysis in the final EIS for the proposed Cook Inlet lease transaction.

NASCA also urges BOEM to adopt program-wide procedures for coordination with submarine cables. With respect to the proposed Cook Inlet transaction and all other initiatives of

[1] U.S. Department of the Interior, Bureau of Ocean Energy Management, BOEM 2016-004, *Cook Inlet Planning Area, Oil and Gas Lease Sale 244 - Draft Environmental Impact Statement* (June 2016), http://www.boem.gov/ak-eis-ea/.

BOEM's oil and gas energy programs going forward, BOEM must minimize the risk of damage to existing and planned submarine cable systems, which comprise the backbone of U.S. international communications and the Internet and are essential to the economic and national-security interests of the United States.

NASCA is the principal non-profit trade association for submarine-cable owners, submarine-cable maintenance authorities, and prime contractors for submarine-cable systems operating in North America. NASCA's members include:

- Alaska Communications System
- Alaska United Fiber System Partnership, a subsidiary of General Communication, Inc.
- Alcatel-Lucent Submarine Networks
- Apollo Submarine Cable Ltd.
- AT&T Corp.
- Columbus Networks
- Global Cloud Xchange (f/k/a Reliance GlobalCom)
- Global Marine Systems Ltd.
- GlobeNet
- Hibernia Atlantic
- Level 3 Communications, LLC
- PC Landing Corp.
- Rogers Communications
- Southern Cross Cable Network
- Sprint Corporation
- Tata Communications (America) Inc.
- Tyco Electronics Subsea Communications LLC
- Verizon Business

NASCA's members own and operate the vast majority of active submarine cable systems landing in the United States. NASCA members' cables land in seventeen U.S. states and territories, with thousands of kilometers of installed cable traversing the U.S. outer continental shelf ("OCS") and many more under construction or in the planning stage.

These comments are divided into three parts. *First*, NASCA explains the critical importance of submarine cables and the risks posed by uncoordinated oil and gas activities on the U.S. OCS. *Second*, NASCA identifies errors and omissions in the Bureau's analysis of submarine cable impacts in the Draft EIS. *Third*, NASCA describes program-wide procedures that would improve the protection of submarine cable infrastructure through coordination and consultation with submarine cable owners.

I. UNCOORDINATED OIL AND GAS ACTIVITIES ON THE U.S. OCS POSE SIGNIFICANT RISKS TO SUBMARINE CABLES AND U.S. ECONOMIC AND NATIONAL-SECURITY INTERESTS

More than 95 percent of U.S. international voice, data, and Internet traffic travels by submarine cable—and that percentage will continue to increase over time.[2] Submarine cables provide higher-quality, more reliable and secure, and less expensive communications than do communications satellites.[3] Submarine cables also provide the principal connectivity between the contiguous United States and Alaska, Hawaii, American Samoa, Guam, Puerto Rico, and the U.S. Virgin Islands, as well as significant connectivity within Alaska, Hawaii, and the U.S. Virgin Islands.[4]

Submarine cables play a critical role both in ensuring that the United States can communicate with itself and the world, and in supporting the commercial and national-security endeavors of the United States and its citizens. Submarine cables support U.S.-based commerce abroad and provide access to Internet-based content, a substantial percentage of which is still

[2] *See Submarine Cables and the Oceans – Connecting the World*, UNEP-WCMC Biodiversity Series No. 31 (UNEP-WCMC and ICPC, 2009) at 8, *available at* www.iscpc.org/publications/ICPC-UNEP_Report.pdf (noting that more than 95 percent of the world's telecommunications and Internet traffic is routed via submarine cable) ("UNEP-WCMC-ICPC Report").

[3] *Id*. at 15-16.

[4] *Cf. id.* at 16; *see also* TeleGeography, Submarine Cable Map, http://www.submarinecablemap.com.

located in the United States, as evidenced by interregional Internet traffic flows.[5] They also carry the vast majority of civilian and military U.S. Government traffic, as the U.S. Government does not generally own and operate its own submarine cable systems for communications purposes.[6] Because of their critical importance to U.S. economic and national-security interests, submarine cables have long been designated as critical infrastructure by the U.S. Government.[7]

Submarine cables—which typically have the diameter of a garden hose—are laid and repaired by cable ships built specifically for cable-related operations and designed for covering vast distances and multi-month deployments. Cable ships are crewed by highly trained and experienced merchant mariners, submersible engineers, and cable operations staff. These ships use a variety of remotely operated vehicles ("ROVs"), sea plows, lines, and grapnels for manipulating cable and repeaters beyond the ship, whether in the water column or on the seabed.

Cable maintenance providers contract with individual owners of submarine cable systems and with regional maintenance authorities for the provision of long-term maintenance services. They also occasionally contract with system owners for one-off maintenance operations. Cable

[5] *See* TeleGeography, Global Internet Map 2012, http://global-internet-map-2012.telegeography.com.

[6] *See, e.g.*, John Cummings, *Contract Awarded for Kwajalein Cable System*, U.S. Army News, June 13, 2008, *available at* www.army.mil/-news/2008/06/13/9972-contract-awarded-for-kwajaleincable-system-kcs/ (describing Defense Information Systems Agency's contract for service on the privately-owned HANTRU1 system, which will connect Guam with the U.S. Army Kwajalein Atoll/Reagan Test Site in the Republic of the Marshall Islands); Naval Facilities Engineering Command, Capabilities, *available at* https://www.navfac.navy.mil/products_and_services/ci/products_and_services/naval_ocean_facilities_program/capabilities.html.

[7] Presidential Policy Directive – Critical Infrastructure Security and Resilience, PPD-21 (Feb. 12, 2013), www.whitehouse.gov/the-press-office/2013/02/12/presidential-policy-directive-critical-infrastructure-security-and-resil; *See* Department of Homeland Security, Communications Sector-Specific Plan (2010), www.dhs.gov/xlibrary/assets/nipp-ssp-communications-2010.pdf.

and repeaters for repairs are typically manufactured on a system-specific basis and kept on hand for immediate use by the maintenance provider.

When damage occurs to submarine cables, it most often is caused by human activities such as commercial fishing (in which nets and clam dredges ensnare cables), vessel anchors, dredging related to sand and mineral extraction, petroleum extraction, and pipeline construction.[8] Timely repairs are critical given the economic and national-security significance of traffic carried by these cables. Consequently, maintenance providers and cable ships must be prepared to respond rapidly, with continuously-qualified personnel, vessels on stand-by, and appropriate equipment. Recent damage to submarine cables in Alaska in 2013 and 2014, east Africa in 2012, in the Pacific following the Tohoku earthquake in 2011, and in east Asia, south Asia, and western Africa in July and August of 2009, underscores the importance of such maintenance operations.[9]

[8] *See* UNEP-WCMC-ICPC Report at 43-48; International Cable Protection Committee, *Fishing and Cables: Working Together* (2d ed. 2009), *available at* www.iscpc.org/information/Openly%20Published%20Members%20Area%20Items/ICPC_Fishing_Booklet_Rev_2.pdf; International Cable Protection Committee, *Loss Prevention Bulletin: Damage to Submarine Cables Caused by Anchors* (Mar. 18, 2009), www.iscpc.org/publications/Loss_Prevention_Bulletin_Anchor_Damage.pdf; International Cable Protection Committee, *About Submarine Telecommunications Cables* (presentation), Oct. 2011, *available at* http://www.iscpc.org/publications/About_SubTel_Cables_2011.pdf ("About Submarine Telecommunications Cables").

[9] *See* Pat Forgey, *5.9 earthquake causes telecom outage in Southeast Alaska*, ALASKA DISPATCH NEWS (July 25, 2014), www.adn.com/article/20140725/59-earthquake-causes-telecom-outage-southeast-alaska (last visited Aug. 15, 2014); David Smith, *East Africa internet access slows to a crawl after anchor snags cable*, THE GUARDIAN (UK) (Feb. 28, 2012), *available at* http://www.guardian.co.uk/world/2012/feb/28/east-africa-internet-access-anchor (last visited Aug. 15, 2014); Solomon Moore, *Ship Accidents Sever Data Cables Off East Africa*, WALL ST. J. ONLINE, Feb. 28, 2012, http://online.wsj.com/article/SB10001424052970203833004577249434081658686.html; Owen Fletcher & Juro Osawa, *Rush to Fix Quake-Damaged Undersea Cables*, WALL ST. J. ONLINE, Mar. 15, 2011, http://online.wsj.com/article/SB10001424052748704893604576199952421569210.html;

Given the location of submarine cables on the seafloor, and the need for prompt access to submarine cables for repairs and maintenance, oil and gas activities on the U.S. OCS create a number of risks to submarine cable systems and the essential activities they support.

A. Direct Physical Disturbance

First, oil and gas exploration and production activities risk disturbing the seabed and damaging existing submarine telecommunications cables. These activities including anchoring of production platforms and semi-submersible drill rigs (which use particularly large anchors), support vessels, barges, and tankers; core sampling; use of drills, dredges, hydraulic jets, and cutting tools; and use of ROVs. These activities also present a threat of erosion and abrasion, destabilization of the seafloor, and redeposited sediments, all of which may result in exposing or suspending cables above the seafloor, thereby subjecting them to a heightened risk of damage from vessel traffic and fishing nets and anchors, as well as the risk of debris accumulating on cables. Risks of cable fault increase, while the presence of oil and gas exploration and exploitation activities limits cable vessel access for maintenance and repair, increasing the complexity of such activities, and driving up the time and costs involved.

B. Pipeline Proximity to, and Crossings with, Submarine Cables

Offshore oil and gas operators also frequently run pipelines from their installations back to shore. Pipeline crossing with submarine cables pose direct physical disturbance risks during installation, operation, and maintenance activities for submarine cables and add significant complexity during repair operations for either the cable or the pipeline. Submarine cable owners therefore seek to coordinate with pipeline owners to ensure safe crossing.

Sean Buckley, *Southeast Asia undersea cable suffers major damage*, FIERCETELECOM.COM (Aug. 13, 2009), http://www.fiercetelecom.com/story/southeast-asian-undersea-cable-suffers-major-damage/2009-08-13.

Submarine cable installers and operators prefer not to run cables in parallel tracks for long distances but rather to have the cables cross so that the cables are in close proximity only where they cross. This minimizes complexity for repair operations, among other benefits. Cable operators therefore consult with each other when planning a cable crossing, and it is standard to seek permission for a crossing.[10] They do this to minimize the risk of damage to other cables during installation and maintenance operations, and also to ensure route diversity across a number of cables. This route diversity preserves connectivity between domestic or international points—for a single cable system, or across systems in a region.

As with crossings between cables, cable owners enter into crossing agreements with pipeline owners to minimize conflict and maximize access for maintenance purposes.[11] This protects both the cable operator and the pipeline owner from potential damage to their respective systems from the routine operations and maintenance of the other. Each additional pipeline crossing adds risk, complexity, and cost to the submarine cable operators' installation, operations, and maintenance activities—which ultimately are reflected in the costs of communications services or in capacity constraints due to difficulties laying new systems.

C. Impeded Access—at Both the Ocean Surface and Seafloor—for Installation and Maintenance

In addition, large offshore developments impede access to submarine telecommunications cable systems both at the surface (for cable ships) and on the seafloor (for cables). Cable ships are large vessels, and require space in which to maneuver when installing or repairing submarine

[10] *See* International Cable Protection Committee Recommendation No. 2, at 4, available from the International Cable Protection Committee at www.iscpc.org. Although permission is generally granted, there have been instances where the crossing company assumes liability for damage of the crossed cable if the crossing is planned in a congested area or in proximity to a repeater or other underwater body.

[11] *See* ICPC Recommendation No. 3.

cables, and to accommodate the effect of bad weather on the ocean. Offshore developments involving large structures, like oil platforms, present obstacles precluding cable ships from having ready access to the sea floor and to previously-installed cables.

Offshore developments that cover large areas of sea floor have the effect of forcing new submarine telecommunications cable projects into "gaps" on the sea floor between offshore developments. This, in turn, limits the access that cable vessels and the equipment necessary for cable installation (sea plows) and repair (grapnels and ROVs) have to the sea floor and the cable laid there. The result is to make the already complex tasks of cable installation and maintenance exponentially more complex, meaning that cable faults will be repaired less quickly and communications system outages will last longer, and that the costs to operators and the customers they serve could increase considerably.

II. THE ANALYSIS OF SUBMARINE CABLE IMPACTS MUST BE CORRECTED

BOEM's analysis of impacts on submarine cables contains a number of errors and omissions that must be corrected in the final EIS. First, BOEM dangerously underestimates the risks described above, and minimizes the grave consequences of damage to submarine cables when it occurs. Second, the Draft EIS fails to account for one of the principal submarine cable systems in Cook Inlet, which constitutes part of U.S. critical infrastructure and provides critical connectivity for the State of Alaska. Finally, the Draft EIS conflates submarine cables with "oil and gas and related infrastructure," further diminishing the significance of the proposed lease's potential impact on submarine cable systems. The final EIS should correct these errors and omissions, and accord appropriate significance to submarine cables and the risks posed by oil and gas activities on the U.S. OCS.

A. The Draft EIS Underestimates the Risks and Consequences of Damage to Submarine Cables

As part of its analysis of the environmental consequences of the proposed lease, BOEM briefly discusses the possibility that seafloor disturbance caused by oil and gas activities will damage submarine cables. The Draft EIS states that:

> Seafloor disturbance and habitat alteration is an [impact-producing factor] for oil and gas and related infrastructure due to the potential impact to existing submarine fiber optic cables in Cook Inlet (Section 3.4.1). Because the precise locations of all submarine fiber optic cables are well documented and readily available for the geohazards report, it is highly likely that personnel conducting geophysical work associated with oil and gas activities would have this information and take preventive measures to ensure that any seafloor disturbance does not impact these cables. In the remote chance any subsea disturbance did damage submarine cables, the anticipated impacts would only last as long as it took to repair the cables; thus, impacts would be expected to be localized and short-term, and thus minor.[12]

This analysis is both incomplete and incorrect. As an initial matter, although seafloor disturbance can indeed cause damage to submarine cables, the analysis fails to address other potential impacts from oil and gas exploration and exploitation activities. To perform installation and maintenance—and to conduct critical cable repairs in the "short-term" as contemplated by BOEM's analysis—cable operators must have unimpeded access to submarine cables at both the seafloor and the ocean surface. As explained above,[13] the presence of large offshore developments and pipeline crossings adds significant complexity and risk to these procedures, even in the absence of any seafloor disturbance. Thus, in the final EIS, BOEM should revise its analysis to account comprehensively for all potential impacts that oil and gas activities may have on submarine cable systems.

[12] Draft EIS at 4.3.19.1.

[13] *See* Sections I.A-C *supra*.

BOEM's analysis also inappropriately assumes that the risk of damage to submarine cable infrastructure is "remote" without acknowledging the critical importance of coordination with submarine cable owners. Coordination is essential to the prevention of damage to submarine cables—and does not occur on its own. In the final EIS, BOEM should make clear that effective coordination is a core obligation of lessees—and not a foregone conclusion that justifies downplaying the hazards posed by oil and gas activities.

Most importantly, BOEM severely underestimates the consequences when submarine cables are damaged. Damage to submarine cables—like all U.S. critical infrastructure—is never "localized" or "minor," as it can result in significant disruptions of communications and slower Internet speeds. These disruptions pose grave risks to U.S. national-security and economic interests, given the U.S. Government's reliance on such cables to communicate with its civilian and military personnel worldwide and with other governments, and given the dollar-value of commerce conducted using submarine cables.[14] In its revised analysis, BOEM should acknowledge the severity of harms caused by disruptions in submarine cable service.

B. The Draft EIS Omits Discussion of a Critical Submarine Cable System in the Cook Inlet

In conducting its cumulative effects analysis, BOEM sought to identify all "past, present, and reasonably foreseeable future actions," including "[s]ubmarine cable projects," to evaluate "their effects on the marine, coastal, and human environments."[15] BOEM identified "[t]wo submarine cable projects" for this analysis: the Alaska-Oregon Network and the United Utilities

[14] *See, e.g.*, Economic Impact of Submarine Cable Disruptions, APEC Policy Support Unit (Feb. 2013), http://publications.apec.org/publication-detail.php?pub_id=1382.

[15] *See* Draft EIS at 5-2, 5-3, 5-21, and 5-34.

Fiber Optic Cable.[16] BOEM failed, however, to account for the Kodiak Kenai Fiber Link ("KKFL"), a third submarine cable traversing the proposed lease area—notwithstanding KKFL's clear identification on a TeleGeography map included elsewhere in the Draft EIS.[17] In the final EIS, BOEM should address KKFL consistently, and take care to avoid any suggestion that KKFL or any other submarine cable system does not exist or has gone out of service.[18]

C. The Draft EIS Conflates Submarine Cables with "Oil and Gas and Related Infrastructure"

In describing elements of the environment affected by the proposed lease transaction, BOEM notes that "several submarine telecommunications cables run from Anchorage through much of the lower Cook Inlet and also from the Kenai Peninsula across Cook Inlet to Illiamna Bay which traverses the Cook Inlet Program Area."[19] The Draft EIS also provides a map of submarine cables located in and around the Cook Inlet published by TeleGeography.[20] While helpful, this cursory discussion appears in a section addressing "Oil and Gas and Related Infrastructure."[21] Submarine cable systems, however, are neither equivalent nor closely related to oil and gas infrastructure. BOEM repeats this mistake in its (inaccurate) analysis of the risks to submarine cables posed by seafloor disturbance.[22] In the final EIS, BOEM should correct its

[16] *Id*.

[17] Draft EIS at 3-213 & Figure 3.4.1-1.

[18] NASCA notes that other marine activities must continue to coordinate with owners of out-of-service cables. *See* ICPC Recommendation No. 1.

[19] Draft EIS at 3-213.

[20] *Id*.

[21] *Id*. at 3.4.1.

[22] *Id*. at 4-224.

confusing placement of discussion of submarine cable infrastructure, and guide readers more effectively to an improved analysis of submarine cable impacts.

III. BOEM SHOULD ADOPT PROGRAM-WIDE PROCEDURES FOR COORDINATION WITH SUBMARINE CABLES

As BOEM continues to identify submarine cables during its planning processes and refines its analysis of risks and harms, it also should adopt procedures to promote coordination and consultation with submarine cable owners on a program-wide basis. Specifically, BOEM should adopt operational guidelines for lessees engaged in offshore oil and gas activities, much as it has done for offshore renewable energy programs administered by its Office of Renewable Energy Programs ("OREP"). In addition, BOEM should require adequate spatial separation between submarine cable systems and oil and gas activities taking place on the U.S. OCS. BOEM also should continue to establish coordination mechanisms with other federal agencies, and revise its lease and right-of-way grant documentation to recognize the presence of and federal legal protections for submarine cables.

A. BOEM Should Adopt Operational Guidelines for Oil and Gas Activities on the U.S. OCS

In its Guidelines for Information Requirements for a Renewable Energy Construction and Operations Plan (the "COP Guidelines"), OREP provides lease applicants, lessees, and operators of facilities on a commercial lease with "guidance on survey requirements, project-specific information, and information to meet the requirements" of statutory and regulatory provisions.[23] As part of its guidance, OREP encourages lessees to coordinate with the owners and operators of

[23] U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs, Guidelines for Information Requirements for a Renewable Energy Construction and Operations Plan (COP) Version 3.0 (Apr. 7, 2016).

existing submarine cables "as early as practicable in the project planning process," as well as with all "potential owners and operators of any telecommunications cables that are planned for installation in the lease area."[24] To facilitate this coordination, OREP provides detailed recommendations concerning review of nautical charts and mapping data[25] and consultation with NASCA and submarine cable owners and operators. OREP also encourages lessees to gain familiarity with existing guidelines and standards for coordination, including those published by the International Cable Protection Committee ("ICPC"). Critically, to facilitate review of renewable energy projects, the COP Guidelines also recommend that lessees include coordination information in their submission of construction and operations plans, which BOEM must approve.[26]

These guidelines reinforce the critical importance of coordination with submarine cable owners, provide lessees with essential resources to coordinate effectively, and facilitate BOEM's consideration of impacts on critical infrastructure when reviewing proposed operational plans. To ensure the protection of submarine cables, BOEM should adopt similar guidelines for OCS activities authorized as part of its oil and gas energy programs.

B. BOEM Should Recognize Spatial Separation Standards to Ensure Protection of Submarine Cables

Effective cable protection requires spatial separation between submarine cables and other marine activities (including other submarine cables). With sufficient separation, the risks of

[24] *Id.* at 60.

[25] The COP Guidelines refer specifically to an online submarine cable mapping resource maintained by NASCA that provides detailed location information for submarine cables in the U.S. territorial sea and U.S. OCS areas. *See* NASCA Member Submarine Cable System Maps, NASCA, http://www.n-a-s-c-a.org/cable-maps/ (last visited September 1, 2016).

[26] *See* 30 C.F.R. § 585.600.

direct physical disturbance or impeded access for timely maintenance or establishment of diverse routes can be minimized. Because of the value of spatial separation as a means of protecting submarine cables, industry organizations have developed recommendations and standards for appropriate separation distances.[27]

In a report adopted with unanimous support in 2014, the Communications Security, Reliability, and Interoperability Council ("CSRIC")—a federal advisory committee that advises the FCC, and which included OREP in its submarine cable working group—adopted a report recommending default separation distances of 500 meters in water depths of less than 75 meters and the greater of 500 meters or two times the depth of water in greater water depths.[28] A default separation distance establishes a minimum separation distance between an existing submarine cable and another marine or coastal activity, absent a mutual agreement to allow the activity in closer proximity to the submarine cable (which sometimes includes assumption of liability or up-front payments to cover the risk of potential damage to submarine cables).

Federal agencies—including BOEM—have long employed the concept of default separation distances in their regulatory activities to reduce spatial conflicts between marine activities. Indeed, BOEM has reached an informal agreement with the U.S. Coast Guard not to

[27] Industry standards have been developed over many decades to facilitate cable installation, retrieval, and repair operations above and below the ocean surface. These standards minimize the risk of damage to neighboring cables during installation and maintenance operations and ensure access to a damaged cable with both a cable ship and other equipment to be used on the sea floor. *See, e.g.*, International Cable Protection Committee Recommendation No. 2, at 5, available from the International Cable Protection Committee at www.iscpc.org.

[28] Communications Security, Reliability and Interoperability Council, *Working Group 8 Submarine Cable Routing and Landing Final Report—Protection of Submarine Cables Through Spatial Separation* at 13 (Dec. 2014), http://transition.fcc.gov/pshs/advisory/csric4/CSRIC_IV_WG8_Report1_3Dec2014.pdf.

allow the installation of wind energy structures within one nautical mile of a traffic separation scheme.[29] The U.S. Coast Guard also regularly establishes safety zones around facilities' energy exploration and exploitation activities on the U.S. OCS "to promote the safety of life and property on the facilities, their appurtenances and attending vessels, and on the adjacent waters within the safety zones."[30] Consistent with ICPC and other industry standards, many foreign governments also have established default or minimum separation distances to protect submarine cables.

Building on these existing efforts, BOEM should recognize similar standards in its administration of oil and gas energy programs to ensure that oil and gas activities are sufficiently separated from submarine cable infrastructure.

C. BOEM Should Increase Coordination with Expert Agencies and Revise Lease and Right-of-Way Grant Documentation to Recognize the Presence of and Federal Legal Protections for Submarine Cables

NASCA urges BOEM to build on its participation in CSRIC, and arrangement with the U.S. Coast Guard, and further develop interagency coordination measures—especially with federal agencies engaged in regulation of submarine cables or having submarine cable expertise, such as the FCC. The adoption of such measures would provide BOEM with valuable information as it oversees the development of OCS energy resources. In addition, NASCA reiterates its concern that BOEM lease and right-of-way grant documentation does not adequately reflect the presence of submarine cables in the marine environment or the unique

[29] *See, e.g.*, *Atlantic Wind Lease Sale 3 (ATLW3) Commercial Leasing for Wind Power on the Outer Continental Shelf Offshore Maryland*, Final Sale Notice, 79 Fed. Reg. 38,060 (July 3, 2014). The U.S. Coast Guard stated that "it may determine in the future that a larger setback is necessary under certain circumstances."

[30] 33 C.F.R. § 147.1; *see also id.* § 147.15.

legal protections granted to such cables.[31] NASCA believes it important for lease and grant documents to account not just for the presence and maintenance of existing submarine cables, but also permit surveying for and installation of new submarine cables traversing the U.S. OCS and landing in the United States. BOEM can and should make textual additions and modifications to inform its lessees and grantees about submarine cables and their associated legal regimes.

CONCLUSION

For the reasons stated above, NASCA urges BOEM to revise the Draft EIS and adopt measures to protect existing and planned submarine cable systems.

Respectfully submitted,

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North American Submarine Cable Association

06 September 2016

[31] *See, e.g.*, Comments of the North American Submarine Cable Association, Docket No. BOEM–2014–0059 (Request for Information and Comments on the Preparation of the 2017–2022 Outer Continental Shelf (OCS) Oil and Gas Leasing Program); (filed Aug. 15, 2014); Comments of the North American Submarine Cable Association, Docket No. BOEM–2011–0082 (Right-of-Way Grant of Submerged Lands on the Outer Continental Shelf to Support Renewable Energy Development) (filed Sept. 28, 2012).

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PUBLIC SUBMISSION

As of: September 07, 2016
Received: September 06, 2016
Status: Posted
Posted: September 06, 2016
Tracking No. 1k0-8rra-oogz
Comments Due: September 06, 2016
Submission Type: Web

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0080
Comment from Erik Huebsch, United Cook Inlet Drift Association

Submitter Information

Name: Erik Huebsch
Address:
43961 K-Beach Rd
Ste E
Soldotna, AK, 99669
Email: info@ucida.org
Phone: 9072609436
Fax: 9072609438
Organization: United Cook Inlet Drift Association

General Comment

See attached file(s)

Attachments

2016.9.6.Lease Sale 244 comments

United Cook Inlet Drift Association

43961 K-Beach Road, Suite E • Soldotna, Alaska 99669 • (907) 260-9436 • fax (907) 260-9438
• info@ucida.org •

September 6, 2016

BOEM Director Abigail Ross-Hopper
1849 C Street, NW
Washington, D.C. 20240

RE: Lease Sale 244

Ms. Ross-Hopper:

United Cook Inlet Drift Association (UCIDA) represents over 500 commercial salmon fishing families that live and work in the Cook Inlet region. We are writing in opposition of Lease Sale 244.

This sale encompasses as area of Lower Cook Inlet that is the most productive fishing area for the Cook Inlet Salmon Drift Gillnet Fleet. Many activities associated with oil and gas exploration and development are incompatible with the Essential Fish Habitat in this area.

UCIDA submitted questions regarding this sale in previous correspondence dated November 3, 2014. These questions remain unanswered as of this date.

This lease sale puts renewable and sustainable fisheries as risk, as well as the livelihoods of hundreds of fishing families. Therefore, we must remain in opposition of Lease Sale 244.

Sincerely,

Original Signed Document

Erik Huebsch
UCIDA Vice President

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General Public

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PUBLIC SUBMISSION

As of: August 23, 2016
Tracking No. 1k0-8qy0-afiu
Comments Due: September 06, 2016

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0025
Comment from Peter MCKAY, NA

Submitter Information

Name: Peter MCKAY
Organization: NA

General Comment

Please see Uploaded file "McKay - Comments Lease Sale 244 7-24-16.docx"

Attachments

McKay - Comments Lease Sale 244 7-24-16

To: Abigail Ross Hopper – Director
Bureau of Ocean Energy Management, Alaska OCS Region
3801 Centerpoint Drive, Suite 500
Anchorage, AK 99503-5823

From: Peter E McKay **ADDRESS WITHELD**

Date: July 24, 2016

Subject: Public Comments on Lease Sale 244 Draft Environmental Impact Statement for Docket ID: BOEM 2014-0001

Lease sale 244 should only be permitted using alternatives to provide maximum protection to resources in the affected environment.

Only with the conditions described in the four (A thru D) alternatives below - should be this Draft Environmental Impact Statement (EIS) be considered.

A. Alternatives 3C (Beluga Nearshore Feeding Areas Mitigation (224 blocks for sale with seasonal mitigation and 146 blocks within 10 miles of major anadromous streams subject to additional mitigation)) ,
B. 4A (Northern Sea Otter Critical Habitat Exclusion (offer 217 blocks for sale)),
C. 5 (Gillnet Fishery Mitigation), and
D. 6 (Prohibition of Drilling Discharges)

These conditions are required by Draft EIS Chapter 1.5.4 (Page 1-12) which requires all Outer Continental Shelf (OCS) oil and gas exploration, development, production and decommissioning activities to be conducted in a safe and pollution-free manner and utilizing the best available and safest technology.

1. The catastrophic effect of a Very Large Oil Spill (VLOS) is examined with a loss of well control for an 80 day duration. While I understand the rational for evaluating this worst case scenario – the planning for VLOS must be managed to reduce the allowable time for release to 40 days or less. The 80 day duration is not acceptable in these times in this location. I suggest that BOEM implement stringent requirements that ensure that all necessary well control equipment (Capping stack, cap and flow system, and containment dome) and supplies are on-site and ready. This includes having a separate standby rig available to drill a relief well. This is a minimum requirement for all drilling exploration activities in this Lease Sale.

2. Cook Inlet Planning Area, Oil and Gas Lease Sale 244 - Draft EIS Volume 2 Chapter 5.2.3 Underwater Acoustic Environment. (Page 5-33). This includes Table 5.2.3-1 – Other Activities Potentially Affecting the Underwater Acoustic Environment. Notably absent is discussion about the noise impact from the EXXON/Alaska LNG Pipeline.

There is general discussion about State Waters and Onshore Oil and Gas – but no discussion about the effects or the potential impact of the 2015 & 2016 LNG Mainline and Marine terminal area Geophysical and Geotechnical (G&G) surveys in the Upper Cook Inlet. There would likely be an effect on Marine Mammals from this survey – especially on the Beluga whale population. In 2012 when considering the Analysis of Cumulative Effects – the Draft EIS chose not to include the effect of the Alaska LNG pipeline project. This quote was found in Chapter 5- Page 13. "Because the project is in the early stages of the permitting process and environmental analysis has not yet begun, it is considered not reasonably foreseeable and will not be included in the cumulative analysis." While the full cumulative effect may not be realized if the LNG Pipeline project is deferred or not installed as drafted – the ExxonMobil Geophysical and Geotechnical Survey was conducted and should be considered in the cumulative analysis. ExxonMobil Alaska LNG LLC (EMALL) did conduct geophysical and geotechnical surveys in Cook Inlet to investigate the technical suitability of a pipeline corridor across Cook Inlet and potential marine terminal locations near Nikiski. The proposed activity occurred over 84 days during the open water season after August 14, 2015. On August 21, 2015, NMFS issued an IHA for the survey (80 FR 50990, August 21, 2015). This IHA expires August 13, 2016. This IHA was utilized for additional 2016 G&G studies of the proposed pipeline corridor between Nikiski and Beluga and to study the proposed LNG Marine Terminal area in Nikiski. The following specific aspects of the proposed activities were determined to likely result in the take of marine mammals: use of a seismic airgun, subbottom profiler (compressed high-intensity radiated pulse (CHIRP) and boomer), and possibly a vibracore. In October 2015 EMALL submitted an application for an IHA for the taking of marine mammals incidental to a similar geotechnical and geophysical survey proposed to occur over 102 days between March 2016 and November 2016 (81 FR 6375, February 5, 2016). At this time it is unknown if this 2016 permit has been approved or will be necessary since the 2015 IHA permit allowed work until August 13, 2016. In my opinion - the G&G Surveys in the Upper Cook Inlet to support the study of the Alaska LNG Mainline marine route must be considered and reasonably foreseeable. The Cumulative effects on the marine acoustic environment should be revised to include the possible effects of the LNG surveys. The pressure on the (endangered) Beluga population caused by the LNG IHA (in their summertime critical habitat) makes protection of the species in Lease Sale 244 even more important. This is another reason to only consider Lease Sale 244 development alternatives that provide maximum protection to the Beluga population. This includes Alternatives 3A, 3B, and 3C as well as Alternative 6 which all provide a measure of protection to the Belugas and their critical habitat.

3. In the EIS Chapter 4 – Environmental Consequences there are several important potential impacts to draw attention to.

4.3.12.12. The Draft EIS considers the impact to subsistence resources from large crude oil spills and concludes (Page 4-193): "Impacts from a large spill of crude oil could cause severe and thus **major** effects to subsistence harvest patterns due to their potential to disrupt subsistence activities; make subsistence resources unavailable or undesirable for use or only available in greatly reduced numbers for a substantial portion of a subsistence season."

4.3.13.4. The Draft EIS considers the impact to Sociocultural Systems and concludes (Page 4-197): "Impacts from a large spill of crude oil could be **major**, depending on the spill location relative to the resources impacted and the duration and extent to which impacts from a large spill disrupt subsistence activities and social organization. Impacts from a large spill would have an indirect and severely adverse effect on sociocultural systems if subsistence fishing and hunting, commercial fishing, and/or personal use salmon fishing were disrupted for one or more seasons."

4.3.20.2. The Draft EIS considers the impact to Environmental Justice and concludes (Pages 4-229 & 4-23): Subsistence remains an important part of the socio-economic and sociocultural systems of rural Alaska (Fall, 2016). The environmental justice communities in Table 3.3.10-1 have mixed subsistence-cash economies with subsistence meeting various cultural, social, and nutritional needs. People living in these environmental justice communities obtain much of their food directly from lands and waters, including subsistence harvest of salmon.

In addition to the economic importance of subsistence, it is a vital part of Alaska Native cultures, identities, and ways of life for these environmental justice communities (Knapp, 2012). Subsistence resources provide more than dietary benefits. They also provide materials for personal and family use, and sharing resources helps maintain traditional family and community organization (Boraas, 2013). Subsistence resources provide special foods for religious and social occasions. Sharing, trading, and bartering of subsistence foods structures relationships within and between communities, and giving of such foods helps maintain ties with family members elsewhere in Alaska (Magdanz et al., 2007).

Subsistence activities are assigned the highest cultural values by Cook Inlet Dena'ina, Alutiiq, and Koniag peoples, and provide a sense of identity in addition to being an important economic pursuit. Many marine and terrestrial species are important for the role they play in the annual cycle of subsistence harvests. Impacts from a large spill are anticipated to be greater in extent and magnitude for environmental justice communities than for predominantly non-Alaska Native communities in the proposed Lease Sale Area. This is primarily due to the anticipated major impacts of large spills on coastal habitats and Areas of Special Concern where environmental justice communities hunt and fish. Impacts of large spills on subsistence harvest patterns and sociocultural systems are anticipated to be major. A large spill would most likely have disproportionately high and adverse environmental and health effects on Alaskan Native peoples living in environmental justice communities in the proposed Lease Sale Area. BOEM expects that a large spill would have environmental justice impacts.

BOEM believes that effective mitigation for environmental justice impacts begins with a commitment to preventing spills in the first place by employing the highest standards for exploration, development, and production technology."

This final BOEM sentence (underlined and in italics) concerning environmental justice impacts clearly states one very important reason to only employ the very best development practices, equipment and regulatory oversight for Lease Sale 244. If a large spill were to occur it will expose Cook Inlet native communities to a disproportionate risk. Lease Sale 244 can only proceed if we only allow the most prudent and responsible development.

4

PUBLIC SUBMISSION

As of: August 23, 2016
Tracking No. 1k0-8r0q-epbh
Comments Due: September 06, 2016

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0026
Comment from Lynn Miller, NA

Submitter Information

Name: Lynn Miller
Organization: NA

General Comment

We strongly opposed this lease sale earlier in the NEPA process, and continues to oppose it because our state and our nation must immediately address climate change, stop developing new fossil fuels, and focus instead on the world class renewable energy resources around Cook Inlet that can support cleaner, more sustainable economies. Importantly, while BOEM offers new offshore fossil fuel leases, it continues to ignore its mandate to promote renewable energy production on the outer continental shelf.

Furthermore, the EIS fails to adequately address:
1. The increasing threats to Alaska's marine ecosystems from climate change & ocean acidification;
2. The long term effects of seismic testing, pipelines, platforms, tankers - and the spills and other pollution that accompany them - on local marine resources;
3. Long term impacts to commercial, sport, personal use and subsistence fishing;
4. Impacts to tourism from the industrialization of Homer and Lower Cook Inlet;
5. Concerns expressed by countless Alaskans to avoid new leasing in Lower Cook Inlet.
6. Effects on the endangered Cook Inlet beluga whale and its prey.

BOEM-2014-0001-0026.html[8/24/2016 9:50:19 AM]

PUBLIC SUBMISSION

As of: August 23, 2016
Tracking No. 1k0-8r9z-gxtn
Comments Due: September 06, 2016

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0027
Comment from David Coray, Silver Salmon Creek Lodge

Submitter Information

Name: David Coray
Organization: Silver Salmon Creek Lodge

General Comment

Once again we're facing an issue of resource extraction for short term gain versus a long overview of balanced energy needs. Lower Cook Inlet carries a tremendous value and infrastructure for both commercial fishing and recreational/tourist opportunities that would be severely compromised by unsightly platforms and high probabilities of oil/gas leaks into the nutrient-rich ocean. Cook Inlet barely escaped the devastating effects of the Exxon Oil spill in 1989, and there should be a zero tolerance for supporting an industry in these waters that, despite all the publicity statements to the contrary, would jeopardize the sensitive eco-system of lower Cook Inlet. I am the owner of a sportfishing and bear photography lodge on the west side of lower Cook Inlet, for 33 years now, and coupled with my total of 64 years in Alaska, am adamantly opposed to any leases for oil/gas in lower Cook Inlet. David Coray, Silver Salmon Creek Lodge

BOEM-2014-0001-0027.html[8/24/2016 9:50:19 AM]

PUBLIC SUBMISSION

As of: August 23, 2016
Tracking No. 1k0-8r9z-be3m
Comments Due: September 06, 2016

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0028
Comment from Mark Luttrell, Citizen

Submitter Information

Name: Mark Luttrell
Organization: Citizen

General Comment

Decision makers:

Finally, America has embraced the research and development of renewable energy. Concurrently, we are recognizing the cost of fossil fuels. A major long-term product of this new thinking is a reduction of greenhouse gases and a slowing of global warming.

Offering more oil and gas lease sales in Cook Inlet (Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244; MMAA104000) retards our progress toward sustainable energy.

Additionally:
- Oil and gas development is guaranteed to spill toxins into a rich marine environment; especially vulnerable Beluga whale habitat.
- There may be long-term negative impacts upon commercial, subsistence and sports fishing.
- Alaskas most stable sustainable industry is tourism. Oil and gas development threatens it.

I do not support offering oil and gas leases in Cook Inlet.

Sincerely,

Mark Luttrell
Seward

BOEM-2014-0001-0028.html[8/24/2016 9:50:19 AM]

PUBLIC SUBMISSION

As of: August 23, 2016
Tracking No. 1k0-8ra1-km5g
Comments Due: September 06, 2016

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0029
Comment from Audrey Elicerio, Ms.

Submitter Information

Name: Audrey Elicerio
Organization: Ms.

General Comment

Along with Cook Inlet Keeper, I am strongly opposed to further lease sales and oil/gas development in the Inlet!! Protecting Cook Inlet from further gas/oil invasion is critical!

Inletkeeper strongly opposed this lease sale earlier in the leasing process, and continues to oppose it because our state and our nation must immediately address climate change, stop developing new fossil fuels, and focus instead on the world class renewable energy resources around Cook Inlet that can support cleaner, more sustainable economies. Importantly, while BOEM offers new offshore fossil fuel leases, it continues to ignore its mandate to promote renewable energy production on the outer continental shelf. Furthermore, the EIS fails to adequately address:

The increasing threats to Alaskas marine ecosystems from climate change & ocean acidification;
The long term effects of seismic testing, pipelines, platforms, tankers and the spills and other pollution that accompany them on local marine resources;
Long term impacts to commercial, sport, personal use and subsistence fishing;
Impacts to tourism from the industrialization of Homer and Lower Cook Inlet;
Concerns expressed by countless Alaskans to avoid new leasing in Lower Cook Inlet.
Effects on the endangered Cook Inlet beluga whale and its prey.

PUBLIC SUBMISSION

As of: August 23, 2016
Tracking No. 1k0-8ra1-13aa
Comments Due: September 06, 2016

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0030
Comment from Neil Frazer, NA

Submitter Information

Name: Neil Frazer
Organization: NA
Government Agency: NA

General Comment

Leasing exploration acreage in lower Cook Inlet and nearby waters would be foolish to a fault, in my opinion. Have you learned nothing from the BP spill in the Gulf of Mexico? Have you learned nothing from the Exxon Valdez, or was that before your time?

If you are saying It's different this time, my reply would be No it's not. I was part of the oil industry for many years and know just how hard it tries to do a good job, but spills are inevitable. No reasonable person would take the last, best marine wilderness and consign it to the certainty of a spill.

Have you ever been underwater when an air gun array (the type of device used in marine oil exploration) was in use? To get some idea what that is like for a cetaceantheir primary sensory modality is sound not visionimagine that your home is between a busy fire hall and a house full of teen-agers playing heavy metal music 24 hours a day. Do you think you might be stressed?

Words fail me.

Sincerely,
Neil Frazer, PhD

PUBLIC SUBMISSION

As of: August 23, 2016
Tracking No. 1k0-8ra3-fcqm
Comments Due: September 06, 2016

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0031
Comment from Libby Stortz, none

Submitter Information

Name: Libby Stortz
Organization: none

General Comment

I strongly oppose this lease sale because Alaska and our nation must immediately stop developing new fossil fuels and instead develop non-fossil renewable energy resources that help address global climate change. While BOEM offers new offshore fossil fuel leases, it continues to ignore its mandate to promote renewable energy production on the outer continental shelf.

The draft EIS fails to adequately address threats to Alaskas marine ecosystems from climate change, ocean acidification, seismic testing, pipelines, platforms, tankers, spills and other pollution that accompany them, on local marine resources including effects on endangered Cook Inlet Beluga Whales and their prey. I does not address impacts to commercial, sport, personal use and subsistence fishing or tourism from the industrialization of Homer and Lower Cook Inlet; and concerns expressed by countless Alaskans to avoid new leasing in Lower Cook Inlet.

I've been a resident of Alaska for 37 years. I subsistence hunt and fish. I am
not employed in the fishing, tourism, oil or renewable energy industries nor have any person financial stake in the sale. My concern is as a citizen of Alaska, the US and the world.

Sincerely,
Libby Stortz

PUBLIC SUBMISSION

As of: August 23, 2016
Tracking No. 1k0-8rah-ws6p
Comments Due: September 06, 2016

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0032
Comment from Rob Lund, Sundog Consultants

Submitter Information

Name: Rob Lund
Organization: Sundog Consultants

General Comment

I am strongly opposed to the issuance of permits under Cook Inlet Oil and Gas Lease Sale 244. Please stop this lease sale immediately.

PUBLIC SUBMISSION

As of: August 23, 2016
Tracking No. 1k0-8rai-touj
Comments Due: September 06, 2016

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0033
Comment from Joseph Poniewaz, private citizen

Submitter Information

Name: Joseph Poniewaz
Organization: private citizen

General Comment

Dear sirs ,
I am strongly opposed to oil and gas leases in the Cook Inlet watershed / area. My first reason is the strong probability of oil spills and other causes of water quality degradation. My second reason is that these leases do not help drive our country towards seeking more use of renewable energy sources. Climate change driven by the continued reliance on fossil fuels will be the defining challenge for our country and the world for decades to come and we must start the fight now. I will forward my thoughts on this to my respective Congressional representatives. Thank you,
Joseph Poniewaz

BOEM-2014-0001-0033.html[8/24/2016 9:50:19 AM]

PUBLIC SUBMISSION

As of: August 23, 2016
Tracking No. 1k0-8raj-vymg
Comments Due: September 06, 2016

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0034
Comment from Maureen Knutsen, none

Submitter Information

Name: Maureen Knutsen
Organization: none

General Comment

I am an Alaskan resident who is very concerned about current and future impacts in my community and state due to climate change. Protecting our water and salmon for the future is of utmost importance to me and communities of Bristol Bay, where I live.

I strongly agree with Cook Inletkeeper that our state and our nation must immediately address climate change, stop developing new fossil fuels, and focus instead on the world class renewable energy resources around Cook Inlet that can support cleaner, more sustainable economies. Importantly, while BOEM offers new offshore fossil fuel leases, it continues to ignore its mandate to promote renewable energy production on the outer continental shelf.

The EIS must more adequately address:
The increasing threats to Alaskas marine ecosystems from climate change & ocean acidification;
The long term effects of seismic testing, pipelines, platforms, tankers and the spills and other pollution that accompany them on local marine resources;
Long term impacts to commercial, sport, personal use and subsistence fishing;
Impacts to tourism from the industrialization of Homer and Lower Cook Inlet;
Concerns expressed by countless Alaskans to avoid new leasing in Lower Cook Inlet;
Effects on the endangered Cook Inlet beluga whale and its prey.

Thank you for considering my comment.

BOEM-2014-0001-0034.html[8/24/2016 9:50:20 AM]

PUBLIC SUBMISSION

As of: August 23, 2016
Tracking No. 1k0-8rbz-vbkx
Comments Due: September 06, 2016

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0035
Comment from Louis Dupree, self

Submitter Information

Name: Louis Dupree
Organization: self

General Comment

I am completely against the oil and gas lease sale in lower cook inlet. How can we allow the oil companies to drill and take our oil with no compensation to the state. We don't even get a discount for the gas that is used domestically. Therefore, I am against the lease sale and I believe we need to not drill where there is a possible chance a spill would destroy salmon habitat.

BOEM-2014-0001-0035.html[8/24/2016 9:50:20 AM]

PUBLIC SUBMISSION

As of: August 23, 2016
Tracking No. 1k0-8rbe-zlgz
Comments Due: September 06, 2016

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0036
Comment from Lydia Garvey, concerned citizen

Submitter Information

Name: Lydia Garvey
Organization: concerned citizen

General Comment

Nix it! Do your job-Protect Our Public lands, waters, health, wildlife & future! Your attention to this most urgent matter would be much apprecaited by all present & future generations of all species.
Thank you
Lydia Garvey Public Health Nurse
And:
I strongly oppose this lease sale earlier in the leasing process, and continues to oppose it because our state and our nation must immediately address climate change, stop developing new fossil fuels, and focus instead on the world class renewable energy resources around Cook Inlet that can support cleaner, more sustainable economies. Importantly, while BOEM offers new offshore fossil fuel leases, it continues to ignore its mandate to promote renewable energy production on the outer continental shelf. Furthermore, the EIS fails to adequately address:

The increasing threats to Alaskas marine ecosystems from climate change & ocean acidification;
The long term effects of seismic testing, pipelines, platforms, tankers and the spills and other pollution that accompany them on local marine resources;
Long term impacts to commercial, sport, personal use and subsistence fishing;
Impacts to tourism from the industrialization of Homer and Lower Cook Inlet;
Concerns expressed by countless Alaskans to avoid new leasing in Lower Cook Inlet.
Effects on the endangered Cook Inlet beluga whale and its prey

BOEM-2014-0001-0036.html[8/24/2016 9:50:20 AM]

PUBLIC SUBMISSION

As of: August 23, 2016
Tracking No. 1k0-8rax-tryh
Comments Due: September 06, 2016

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0037
Comment from Gurubandhu Khalsa, GurubandhuKhalsa

Submitter Information

Name: Gurubandhu Khalsa
Organization: GurubandhuKhalsa

General Comment

Please do not lease out Lower Cook Inlet land for oil development. This will endanger the endangered blue and gray whales..Oil prices are low anyway so it would not help the US coffers very much. We also need to promote the resources of this region for energy needs. Why not use things like tidal energy and wind energy for this region

PUBLIC SUBMISSION

As of: August 23, 2016
Tracking No. 1k0-8rcv-rwsq
Comments Due: September 06, 2016

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0038
Comment from Shawn Hansen, NA

Submitter Information

Name: Shawn Hansen
Organization: NA

General Comment

I am a resident of Homer AK for 40 years. When I came to Homer in 1976 the Oil Rig George C Ferris was stuck in the mud of mud bay just N.E of the Homer spit, a fine example of mistakes made by the oil industry. Given the sustainable and clean industry's of commercial and and sport fishing, Eco tourism in all it's manifestations which will all be negatively impacted by oil development in Cook inlet. I strongly disagree with oil leases in Cook inlet.
Besides other industry at risk the larger issue that confronts all of human society today is the imperative of ceasing CO2 emissions. It is absolutely imperative that humans stop developing carbon fuels, and put all new investment into non carbon and renewable energy sources.

Sincerely

Shawn Hansen
PO Box 733
Homer AK

PUBLIC SUBMISSION

As of: August 23, 2016
Tracking No. 1k0-8rdb-2b26
Comments Due: September 06, 2016

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0039
Comment from Matthew Koenig, Private citizen

Submitter Information

Name: Matthew Koenig
Organization: Private citizen

General Comment

My name is Matthew Koenig. I am sending a comment along as a concerned citizen.

The DEIS does not include the potential impacts of this lease sale on the climate change crisis. It focuses on potential immediate impacts, and proposes alternatives that will attempt to protect beluga whales, northern sea otters, and mitigate impacts to gillnet fisheries. All of these are important, but in my mind, this is an attempt at defining acceptable loss, despite acknowledging the very real threats that this development would pose to the immediate environment. It is morally ambiguous.

Additionally, the DEIS does not take into account the larger threats of ocean acidification (and what the impacts are on Cook Inlet and its fisheries resources) or include consideration of what impacts to the global climate that consumption of this oil and gas will have. The DEIS only gives consideration to what impacts of extraction are, and not what the impacts of consumption are. Ocean acidification is a side effect of climate change that has a greater potential for harm for shelled organisms in Alaskan waters. Cold waters are capable of holding more gas - and Alaskan waters have been observed as being more acidic than more temperate or tropical waters (source - University of Alaska Fairbanks. "Increased Ocean Acidification In Alaska Waters, New Findings Show." ScienceDaily. ScienceDaily, 14 August 2009. .)

With the United States entering the legally binding Paris Agreement, now is not the time to be exploring development of offshore oil and gas resources. Continuing with the proposed action / lease sale is in direct conflict with global efforts to limit warming to 2. Developing additional gas and oil fields shows a lack of effort and perhaps even more importantly shows a lack of leadership from the United States government. Other countries are looking to us in this transition to a sustainable future, and we are failing to do our part to adequately address what is a global problem in exchange for short term gains.

In summation, I implore the Bureau of Ocean Energy Management to revise the environmental impact statement to include consideration of increased ocean acidification and increased global temperatures, and evaluate what the impacts will be on Cook Inlet, as it pertains to this particular sale and environmental impact statement. Appropriate weight is not given to these problems we are facing as a society and civilization - all too often we are willing to define what is an acceptable loss without looking at the system as a whole.

I would also take a moment to ask BOEM to choose alternative 2, and to cancel the lease sale. As a further alternative, I would like to see more effort being put into developing the offshore renewable potential that we have in Alaska, and especially in Cook Inlet.

PUBLIC SUBMISSION

As of: August 23, 2016
Tracking No. 1k0-8rdh-2h09
Comments Due: September 06, 2016

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0040
Comment from Deborah Limacher, NA

Submitter Information

Name: Deborah Limacher
Organization: NA

General Comment

My name is Deborah Limacher and I am a 40 year resident and commercial fisherman,now vacation rental owner living in Homer.I have lived through the Cook Inlet oil spill of 1987,worked diligently to try and clean the tar balls in our waters from the Exxon oil spill of 1989 where the entire drift gillnet fishery was shut down due to the impossibility of removing the oil.I've watched my fishery go down hill from it's effects ever since.Cook Inlet is a designated sockeye salmon commercial fishery and a major King salmon sport fishery.1000's of people from all over our state and around the world travel here to experience our pristine beauty.I cannot understand why the BOEM would even consider opening up more oil and gas leases in this our home,especially when the Inlet and its marine life already faces so many challenges with ocean acidification,seismic testing,platforms,tankers and oil spills.You are the Bureau of Ocean Energy Management,not the Bureau of Oil and Gas Management.To my knowledge,BOEM is mandated to promote renewable energy production on the outer continental shelf.Cook Inlet is rich in resources that would sustain such production,assuring that this land is here for our generations to come and pristine for the 1000's that come here each and every year to enjoy our rich marine ecosystems.And now with the threat of fracking here just 31/2 miles off our coast;I say NO MORE!! It's time that we rather stop developing fossil fuels and focus instead on our rich world class renewable energy resources around Cook Inlet and Alaska that can support cleaner,more sustainable economies.

PUBLIC SUBMISSION

As of: August 23, 2016
Tracking No. 1k0-8rdy-ab0s
Comments Due: September 06, 2016

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0041
Comment from Dora Coen, NA

Submitter Information

Name: Dora Coen
Organization: NA

General Comment

I oppose the oil and gas lease sale in Cook Inlet for many reasons. An oil spill, which has a 70% chance of occurring would cause irreparable harm to the marine environment. A winter storm would make cleanup ineffective, I haven't forgotten the Exxon Valdez oil spill. The Homer area is based on tourism and fishing, and oil development would do it no good. Why are you not looking to develope renewable resources as is mandated, according to previous comment on this issue. Also climate change is real, we need to replace our carbon footprint with renewables, not more oil and gas development. I also believe that whatever oil and gas might be under there, if extracted, may cause greater geological instability. If it were removed I think it may make earthquakes more damaging. Everything in nature has a purpose and perhaps we would really regret it someday if that oil and gas were removed. An oil spill would destroy the kachemack bay ecosytem. This is a critical habitat area. People live here for the beauty and pristine environment, they don't want to see oil rigs in the inlet. Please cancel this lease sale, for every bodies sake, thank you.

PUBLIC SUBMISSION

As of: August 23, 2016
Tracking No. 1k0-8rew-wm4y
Comments Due: September 06, 2016

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0042
Comment from Steve McShane, Cook Inlet Keeper

Submitter Information

Name: Steve McShane
Organization: Cook Inlet Keeper

General Comment

It is so difficult to think our government could even consider such an oil development project In an area like Cook Inlet. The environmental concerns are gigantic, we can start with the water quality for people and wild life. increased earth quake damage because of the fracking, air pollution, water pollution, all the fish will be greatly impacted not only because of oil, but also the noise of the fracking. Also, our two lane roads will be impossible to drive on. Our peninsula does not have the infrastructure to support such a project. We also have a very activity volcanic region in Cook Inlet. I could go on and on and on, as to why we should not create such a project. Im afraid you all know they terrible jeopardy you are putting us all in by putting such a project in out back yard. It is so clear how wrong this project is, I'm afraid when we have our troubles as a result of the lease sale, that many damaged residents will hold the government liable for moving ahead on such a dangerous project for the environment.
PLEASE, PLEASE, don't do such a thing. Before you make any decisions you need to take a trip into Cook Inlet and see what you would be saying yes to. You need to say no because this is totally wrong, and I would find it difficult to live with making such a wrong decision Don't do this to us. We have a piece of heaven here and you will be turning it into hell.

PUBLIC SUBMISSION

As of: August 23, 2016
Tracking No. 1k0-8rf9-4tbr
Comments Due: September 06, 2016

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0043
Comment from Eileen Sheridan, NA

Submitter Information

Name: Eileen Sheridan
Organization: NA

General Comment

I am against the proposed Continental Shelf Oil and gas Lease Sale 244 and choose the Alternate 2 from your Draft Environmental Impact Statement which says, "(No Action Alternative), the lease sale would not occur. I know it says there are areas and times that try to protect the, for instance, Beluga whales, seismic tests which could affect fishing, but from birds on down not even minor impacts to our marine resources should be acceptable. Fish and other marine mammals that cross over federal waters would still not be protected even though you show borders, and not even minor impacts should be acceptable.

We are long time Alaskans having commercial fished in southeast Alaska waters, living in the Matsu Valley, and continue to depend on our fish and wildlife for subsistence living now on the Kenai Peninsula. This is one of the most pristine areas of the State not only in scenery but in our fisheries that others living in the USA depend on. However, we are also in an earthquake area and since we recently had over a 7 magnitude earthquake, the chances of one that size or higher still exists which could cause spills. Our infrastructure is not even possible to support such a lease for testing along with building. Having such an industry would affect all resources shown as potentially affected. We had a noisy summer when the State allowed some seismic testing a couple of years ago near Anchor Point. I could go on and on, but our way of living, etc. would be lost forever.

Don't allow the Lease Sale 244 to occur.

Other resources should be explored before even thinking of this. Our tides are some of the strongest.

Thank you!

PUBLIC SUBMISSION

As of: August 23, 2016
Tracking No. 1k0-8rg7-qh4j
Comments Due: September 06, 2016

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0044
Comment from Kevin Walker, Concerned Citizen

Submitter Information

Name: Kevin Walker
Organization: Concerned Citizen

General Comment

A search of the 698 page document for "Alternative Energy" found one reference, on page 4-232, and that referenced "existing alternative energy techniques".

The Bureau of Ocean Energy Management should be spending our taxpayer money to research and develop alternative energy sources from the ocean, ie tides, waves, currents, geothermal, and heat extraction (as is used in the Seward Sea Life Center for heating the building). Oil and gas production leads to climate change, ocean acidification, and massive profits for the richest companies in the world.

I live in the Homer area and do not want to see our fishing and tourism industries damaged or eliminated by the oil companies with their massive spills (Exxon Valdez, BP Gulf of Mexico) and other environmental disasters. Development of alternative, renewable sources of energy from the ocean is desperately needed.

Fossil fuels - oil and gas - are finite and not sustainable. Fossil fuels damage the planet.

*** WE MUST DEVELOP RENEWABLE ALTERNATIVES ***

*** CANCEL THE PROPOSED LEASE SALE ***

PUBLIC SUBMISSION

As of: August 31, 2016
Tracking No. 1k0-8rjh-6k7d
Comments Due: September 06, 2016

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0047
Comment from Nina Faust, None

Submitter Information

Name: Nina Faust
Organization: None

General Comment

Homer, AK 99603

August 25, 2016

To: Bureau of Ocean Energy Management (BOEM)

RE: Cook Inlet Area Lease Sale 244

I have opposed past Lower Cook Inlet Lease Sales. Nothing has changed to make me think it is time to lease oil and gas in the lower Cook Inlet. If anything, concerns about climate change, the need to preserve fossil fuels, and the importance of switching to renewable energy resources make it all the more important not to lease in the Lower Cook Inlet. When will this agency follow its mandate to promote renewable energy production on the outer continental shelf?

The cumulative effects are seemingly glossed over and not addressed. Climate change and ocean acidification seriously threaten the marine ecosystem. Additional infrastructure and activities for oil and gas development and pollution that inevitably happens will have impacts on our local marine life.

Locals depend on fishingsubsistence, personal use, commercial, and sport. Additional oil and gas development will have impacts on these activities.

Homer has long worked for a diverse and sustainable economy based on tourism, arts, fishing, and entrepreneurship. Industrialization will impact this unique economy. Homer area residents have made it clear they prefer this different approach over the boom and bust of oil and gas leasing.

I continue to oppose this sale. It is time to move to renewable energy and stop degrading our environment with continued oil and gas development. It is worth more in the ground. Cancel this sale.

Sincerely,

Nina Faust

PUBLIC SUBMISSION

As of: August 31, 2016
Tracking No. 1k0-8rm7-4eds
Comments Due: September 06, 2016

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0048
Comment from Valerie Luczak, NA

Submitter Information

Name: Valerie Luczak
Organization: NA

General Comment

There is no sense in risking a thriving fishing and tourist industry for the taking of finite and potentially destructive extractive resources, which pays the people of Alaska, the state, virtually nothing. It is time to end this era of give-aways, and political shananigans, and begin to consider the legacy and future of the decisions we make concerning the sustainability of energy systems on our planet..do no harm..the world is already awash in oil and gas, and ultimately we should not compromise other resources or habitats.

PUBLIC SUBMISSION

As of: August 31, 2016
Tracking No. 1k0-8rmn-u64u
Comments Due: September 06, 2016

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0049
Comment from Deborah Voves, NA

Submitter Information

Name: Deborah Voves
Organization: NA

General Comment

Please do not allow fracking in our beautiful state of Alaska. We do not want to see what will happen to our Cook Inlet environment (mudflats, included).

BOEM-2014-0001-0049.html[9/2/2016 8:48:36 AM]

PUBLIC SUBMISSION

As of: August 31, 2016
Tracking No. 1k0-8rmn-ttsp
Comments Due: September 06, 2016

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0050
Comment from Kathleen Kennedy, NA

Submitter Information

Name: Kathleen Kennedy
Organization: NA

General Comment

Ive never been so disgusted in my life!!To have the state finance a Texas company to frack in Cook Inlet is insane for so many
reason:
They still have No source for the millions of gallons of water that it takes to frack.
Stariski Creek that is adjacent to the pad is a world class king salmon river.
This is in one of the most geological sensitive areas in all of North America,The land of 10,000 smokes on west side of inlet is called that because of all the active volcanoes..the tectonic plate in the inlet runs all the way to Denali Park.
It's a wetlands area at the mouth of Stariski.
Commercial fishermen and subsistence people such as my self depend on our clean water fisheries.
They've been releasing gas on the hourly clock as they told us they have no market for the gas..?!EPA are you hearing?!!
I know ppl at the site who have been devastated by the constant noise and bright lights.
They are proposing to truck every 23 min more product to Nikiski by road..the state doesn't plow or sand so many times that I can't make it to work in Soldotna..now what do we have to look out for..skidding oil trucks on our only 2 lane hwy.
Constant lies from the representative when you go to the community meetings!
They've changed the name of their company many times now when they get a disaster that they have no money to clean up and then file for bankruptcy so they can have the state clean up their mess and reemerge as a company w/new name..

BOEM-2014-0001-0050.html[9/2/2016 8:48:37 AM]

PUBLIC SUBMISSION

As of: August 31, 2016
Tracking No. 1k0-8rml-nzvg
Comments Due: September 06, 2016

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0052
Comment from jone suleski, NA

Submitter Information

Name: jone suleski
Organization: NA

General Comment

Since your environmental studies have been conducted Alaska has experienced a 7.1 earthquake on Jan 24th, 2016; which was the strongest of its kind ever recorded in the Cook Inlet area. Because of this, new studies must be conducted to understand the impact and the changes in the area. The EPA cannot continue on responsible until new impact studies are done, no lease should be permitted until this is fully researched.

BOEM-2014-0001-0052.html[9/2/2016 8:48:36 AM]

PUBLIC SUBMISSION

As of: August 31, 2016
Tracking No. 1k0-8rmr-zqbs
Comments Due: September 06, 2016

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0053
Comment from Carol Roberts, NA

Submitter Information

Name: Carol Roberts
Organization: NA

General Comment

This can not be allowed. The dangers of fracking have been made clear in so many places around the country. The Cook Inlet is too important to destroy, which is a certainty sooner or later. Does the environmental impact study consider the recent earthquake? New findings regarding destroyed water supplies?
What possible benefit could this achieve for anyone in the long run? This is only about short term profits at tremendous long term costs.

BOEM-2014-0001-0053.html[9/2/2016 8:51:56 AM]

PUBLIC SUBMISSION

As of: September 07, 2016
Received: August 31, 2016
Status: Posted
Posted: August 31, 2016
Tracking No. 1k0-8rms-5y4u
Comments Due: September 06, 2016
Submission Type: Web

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0054
Comment from Mary McCarthy, NA

Submitter Information

Name: Mary McCarthy
Address:
36279 MyKiss Street
Soldotna, AK, 99669
Email: akcatwrantler@gmail.com
Phone: 9075456645
Organization: NA

General Comment

Please do not put this through, the Kenai Peninsula is a vital eco system without an unbiased environmental impact statement we put this area at risk. Please do not develop this area for oil and gas, the resources are at risk with each new lease given. Thank you.

Mary McCarthy
Soldotna, AK

PUBLIC SUBMISSION

As of: September 07, 2016
Received: August 31, 2016
Status: Posted
Posted: August 31, 2016
Tracking No. 1k0-8rmt-6go1
Comments Due: September 06, 2016
Submission Type: Web

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0055
Comment from Shelli Huls, NA

Submitter Information

Name: Shelli Huls
Address:
3705 Arctic Blvd suite 513
anchorage, AK, 99503
Email: shellihuls1981@gmail.com
Phone: 9074406851
Organization: NA

General Comment

"Since your environmental studies have been conducted Alaska has experienced a 7.1 earthquake on Jan 24th, 2016; which was the strongest of its kind ever recorded in the Cook Inlet area. The EPA cannot continue on responsibly until new impact studies are done, no lease should be permitted until this is fully researched."

Just trying to make it easy...DOCKET 244...BOEM lease 2017 Cook Inlet. It's ONE OCEAN...Yes we'll be affected, our Salmon, our Whales, our Otters, and their entire habitats.

I have lived here for 49 years. Our enviroment and ecosystem are so fragile. Please do more research before allowing fracking. We are still in recovery in several locations years after the Exon Valdez spill.

PUBLIC SUBMISSION

As of: September 07, 2016
Received: August 31, 2016
Status: Posted
Posted: September 01, 2016
Tracking No. 1k0-8rn7-ierj
Comments Due: September 06, 2016
Submission Type: Web

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0056
Comment from lance powell, NA

Submitter Information

Name: lance powell
Address:
4621 golden spring circle
anchorage, AK, 99507
Email: lwpowell1@juno.com
Phone: 9073462327
Organization: NA

General Comment

......we need to protect the Cook Inlet waters from the pollution that would come with oil exploration......

PUBLIC SUBMISSION

As of: September 07, 2016
Received: August 31, 2016
Status: Posted
Posted: September 01, 2016
Tracking No. 1k0-8rn5-w790
Comments Due: September 06, 2016
Submission Type: Web

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0057
Comment from darlene coyle, NA

Submitter Information

Name: darlene coyle
Address:
box 193
kasilof, AK, 99610
Email: ahrkip@gmail.com
Organization: NA

General Comment

The evidence is mounting AGAINST hydraulic fracturing in states all across this great country. havoc is being wreaked on all populations who's water tables have been effected by this toxic and most destructive process. and ultimately, we ALL need clean water. it makes NO SENSE to use pure, potable water in these operations and makes even less sense to store the toxic waste byproducts in open pits in communities, leaving them to offgas toxic heavy metal particles into the very air we breathe. nothing about this process indicates "safety" of any kind! lack of relevant information regarding what chemicals they are using, claiming "proprietary information", is a bold faced LIE! the "chemical cocktails" to which they refer are actually a toxic and highly reactive blend of a variety of toxic byproducts produced by this industry overall. they use fracking to dispose of waste from other areas of their industry!
OUR WILD SALMON are one of the world's greatest treasures and it is WRONG of corporations to force our salmon stocks and in fact, the entire life cycle of these world class salmon into the red zone of near extinction because they have made a "business decision". to have this decision supported by government agencies that are supposed to protect the health and security of it's citizens shows that it is time for a change among the regulating authorities. these

industries have access and the technology necessary to proceed post haste with r&d of energy infrastructure that is much less invasive, destructive and which provides more benefit in the long run to the health of the planet and all who occupy it. please help them change their focus by DENYING ANY FRACKING OPERATIONS IN COOK INLET! to quote Shauna Thornton, one of our local candidates..."WE DESERVE BETTER"! thank you for the opportunity to comment.

PUBLIC SUBMISSION

As of: September 07, 2016
Received: August 31, 2016
Status: Posted
Posted: September 01, 2016
Tracking No. 1k0-8rn5-ftsc
Comments Due: September 06, 2016
Submission Type: Web

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0058
Comment from Terry Eaton, NA

Submitter Information

Name: Terry Eaton
Address:
10824 NE 172nd Ave
Brush Prairie, WA, 98606
Email: john.and.terry@gmail.com
Organization: NA

General Comment

It is abundantly clear that we must end fossil fuel use and transition to carbon neutral energy sources NOW. There is no doubt, and has never really been any doubt. We are the last generation that may have the opportunity to act to try to turn global climate change around. It may already be too late, but adding to the problem, which is the largest threat to world and national security ever faced, is in no ones best interest. Full review of potential impact of such activities has already proven that NO more oil/gas should be extracted, as we can not possibly safely used the amount already extracted. This sale cannot be allowed under any honest analysis of the situation

PUBLIC SUBMISSION

As of: September 07, 2016
Received: August 31, 2016
Status: Posted
Posted: September 01, 2016
Tracking No. 1k0-8rn5-tkf2
Comments Due: September 06, 2016
Submission Type: Web

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0059
Comment from Rahn Thomas, NA

Submitter Information

Name: Rahn Thomas
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8983 N. Tongass Hwy
Ketchikan, AK, 99901
Email: rahnthomas76@yahoo.com
Phone: 707-776-6081
Organization: NA

General Comment

Please leave fracking out of Alaska and Cook Inlet.
Can't we please leave nature alone?
How many states do we have to ruin for the Big Oil companies to line their pockets?
No on Fracking in Cook Inlet!

Representative of Submittals from Jefferson Childs
Document too voluminous to include in FEIS
All documents reviewed and considered

PUBLIC SUBMISSION

As of: September 07, 2016
Received: September 02, 2016
Status: Posted
Posted: September 02, 2016
Tracking No. 1k0-8ro4-o96t
Comments Due: September 06, 2016
Submission Type: Web

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0062
Comment from Jefferson Childs, NA

Submitter Information

Name: Jefferson Childs
Address:
POB 111406
Anchorage, AK, 99511
Email: Oceanauts@gci.net
Phone: (907) 770-0562
Organization: NA

General Comment

My comments are in the attached pdf file. Please extend the Public Comment period a few more weeks as I would like to submit additional constructive comments.

Attachments

BOEM LS 244 DEIS Public Comments 9-1-16

My comments below are intended to help improve the scientific and analytical basis of BOEM's Cook Inlet Lease Sale 244 DEIS. Having reviewed some of MMS's and BOEM's NEPA assessments in the past, I note that certain elements of the DEIS are positive developments in the evolution of BOEM's lease sale environmental analyses. Most specifically, is its use of targeted leasing and alternatives identification based on conservation of living resources. As to be expected, there are deficiencies and possible flaws and my comments below are generally directed therein. Please note that these comments are not intended to signal support or rejection of the proposed action (i.e., a federal offshore oil and gas lease sale and associated activities).

Given that DOI decision making must be robust, of the highest quality, and the result of as rigorous scientific and scholarly processes as can be achieved, it necessary that BOEM's NEPA documents use rigorous scientific documents and current scientific concepts. These then need be used in/for rigorous environmental analyses of BOEM's proposed actions, i.e., the Proposed Lease Sale 244 in Cook Inlet.

I attended a BOEM Public Hearing in August 2016 on the Proposed Lease Sale 244 and received a summary from BOEM officials. On page 8 of the summary, BOEM asks for additional input and specifically asking several questions. I will frame my comments using the questions BOEM posed in the summary, and then follow up with some miscellaneous comments.

BOEM asked: Does the DEIS consider all the habitats, species, places, and activities that may be affected by oil and gas activities? If not, what is missing?

No. The scoping process showed that BOEM needs to analyze and assess includes the impacts of accidental oil spills (large or small) and oil spill responses to all living resources and their habitats (i.e., Cook Inlet Region, northern Gulf of Alaska). An additional objective is to analyze and assess the impacts (direct and indirect) of the proposed action on the ecosystem(s) and its components (including humans). To do so, requires not only identifying the impact producing factors, but also identifying individual components (e.g., species and populations) of the ecosystem(s) to then inspect for possible impacts. The DEIS lists and describes some species that may be impacted by the proposed action, but is far from complete (e.g. fishes). Please list all species of fishes, herps, birds, and mammals occurring in the Cook Inlet Watershed (Estuary) and adjacent waters/lands that may be directly or indirectly impacted by the proposed action and associated activities. To generate a comprehensive list of fish species in the region, I suggest starting your list using Mecklenburg, et al. (2002).

BOEM asked: Does the DEIS characterize the potential impacts well? Why or why not?

BOEM has not brought together the best available science to evaluate potential impacts to a variety of living resources in the region. As such, there are significant data gaps and flawed leaps of logic. Some impact assessments for biological resources are simply not supported by scientifically available information, and some assessments lack rigorous analysis. This is most evident, but not limited to the fish resources. Scientifically available information regarding fish species in the Cook Inlet region, important to analyzing and assessing potential impacts is simply not identified, discussed, or considered in the assessment. This includes specific details regarding the biology and ecology of each species, including but restricted to:

- details of its ecological role

- range
- abundance over time and space
- depth range
- habitat and life history details
- behavior details
- populations or stocks
- reproduction details
- food and feeding details
- biological interactions details
- resilience
- potential impacts stemming from climate change
- further research needs for baseline biological and ecological information

The USGS recently published a catalog of such information for arctic fish species. The catalog was a study funded by BOEM, and consists of publicly available scientific information. Similar scientific information is available for fish species inhabiting the Cook Inlet region, but it appears to not have been considered or used for impacts analysis. It may not be neatly published in one scientific publication, but such information is publicly available. Instead, much of the baseline information drawn on in the DEIS appears copied from ADF&G's species profile webpages, which are oversimplified, and not the best scientific information available. Important information concerning population trends of the present and past 10, 20, 30… years for fish species and populations in the region are not included. Therefore, how could a rigorous analysis for possible impacts to fish populations have been done, and drawn the magnitude of population level impacts and recovery identified in the DEIS? Are individuals of a population clustered, condensed or randomly distributed in the region? Are their habitats limited? What are each populations rates of reproductive success, natural mortality, demographics, responses to climate change over time? What are the survival rates of the different age class cohorts of the population? These details matter for accurately and precisely assessing potential impacts, particularly those attributable to oil spills (large or small) depending on the species or population impacted.

Because a comprehensive species list of vertebrates occurring in the Cook Inlet region was not used, potential impacts to some rare or elusive vertebrate species in the region were not considered. Rare or elusive vertebrates are not necessarily endangered or threatened species, but they can easily become endangered or threatened if not considered in environmental impact assessments. Our world is currently undergoing a sixth extinction, in no small part due to habitat fragmentation and loss. Rare species with populations exhibiting clustered or condensed distributions may be behaviorally, physiologically, or habitat limited from using additional space otherwise thought available for use (largely due to our ignorance of their biology or ecology). A classic example of species extirpations currently occurring is in the Brazilian rainforest where developers are ignorantly converting rainforest habitat to other land uses. Again, using fish resources as an example, there are several species of fish known occurring in the Cook Inlet region that are rare, have limited distributions in the region (e.g., one or a few specimens collected at one or several locations; and/or represent the only known specimens collected in all of southern Alaska)(examine Mecklenburg et al., (2002) to find rare fish distributions in Alaska). BOEM need identify such rare species and assess potential impacts to these unique populations. What happens to a rare fish population (e.g., only a few specimens collected from one location in or adjacent to a lease sale block) when a pipeline, drilling rig, or platform impacts the only known site from which it was collected? These are issues of scale. Not all fish populations are widespread, relatively abundant, demonstrate broad behavioral or physiological

plasticity, or are capable of exploiting other available habitat areas. Furthermore, just as BOEM and lease bidders should know what lease blocks are in or adjacent ESA critical habitat areas, they too may want to know if they might be restricted in developing those leases in the future because one or more lease blocks are where a rare fish species population occurs and their activities might threaten it in the future with an ESA listing for that population.

The DEIS lacks two important comprehensive and detailed models that are needed to inform and analyze indirect impacts to species. These models include (1) a food web model and (2) a interaction web model (each to species-specific level). (A interaction web model represents a network of interactions among species and between species and their physical environments. It captures competitive interactions that a food web model may not.) Each model need also identify the interaction strength between species. Interaction strength is the quantitative influence of one species on the abundance of another. Currently, assessments of living biological resources note possible impacts to a population's food base due to an impact producing factor, but often lack detailed analysis of the scope or ripple effect that may occur in the food web or interaction web and its ecological consequences.

The DEIS analysis considers population level impacts; defining a population as a monospecific group of organisms occupying the proposed Lease Sale Area or nearby areas. Noting again, BOEM's and DOI's commitment to use of rigorous science and analyses, this definition is scientifically flawed unless it meets certain criteria; in this case it does not. The biological sciences definition of a population is "a group of organisms of one species that interbreed and live in the same place at the same time." While BOEM's definition of "population" happens to biologically correct for Cook Inlet beluga or Pacific halibut, it is scientifically flawed for other vertebrate species such as the Pacific salmon species and other geographically separated species groups that do not (or rarely) interbreed. Current ecological science includes scientific concepts, models, and studies of metapopulations; a metapopulation essentially consists of a group of spatially separated populations of the same species which interact at some level. This is critical to accurately and precisely assessing impacts to living resources. For example, the assessment concludes there may be moderate impacts to a local salmon population in Cook Inlet (resulting from a large oil spill), however, unless we know what local population is moderately impacted, we can't know the overall impact to the regions population. Please specify the percent contribution(s) the impacted local population(s) has/have relative to that regions overall population. We need to know if the impacted local population makes up 20% or 90% of the overall regions population. (E.g., an oil spill adversely impacting a salmon population interbreeding in the Susitna or Kenai rivers at a moderate scale is far different than impacting a salmon population interbreeding in Ship Creek.) We need to know if a impacted local population is a source or sink population and how its decline or extirpation may influence other local populations or species in the region.
Please use the scientific definition of a biological population to meet DOI and agency goals and policies (e.g., scientific integrity standards) and analyze impacts to populations and metapopulations. (For more information on marine metapopulations, please see Kritzer and Sale, 2006).

BOEM asked: Are there any impacts you are concerned about that are not discussed? What are they?

Yes. I am concerned that non-native aquatic species may be introduced to the Cook Inlet region or elsewhere in Alaska and subsequently become aquatic invasive species in Alaska (state or

federal waters). Offshore oil and gas operations use and move vessels, rigs, platforms, and various equipment between and among various regions of the world (tropical, subtropical, temperate, subarctic, and arctic) and may transport and introduce non-native aquatic species to Alaska. There is considerable scientific literature on this subject; its risks, costs, etc. Carlton and Ruiz (2005) cite offshore oil and gas industry activities as one possible source of introducing invasive species to a region. There are scientific studies and assessments available detailing the vectors by which a region can be invaded by non-native aquatic (invasive) species. Non-native aquatic (invasive) species may be transported via hull fouling, ballast water, or on equipment used overboard in the water. Any vessel is a potential host for transporting non-native aquatic species. No region, not even the arctic or subarctic, is immune to such introductions. There are publicly available scientific assessments that show moderate to high risks of introductions, particularly when the donor region is similar to a recipient region (e.g., temperate to subarctic; subarctic to subarctic). Given that the Proposed Action would bring vessels, rigs, etc. to Cook Inlet from elsewhere (outside Alaska), and these vessels, etc. may transport non-native aquatic (invasive) species to Alaska, a rigorous impacts analysis by BOEM is necessary based on the NEPA and federal regulations. Please analyze potential impacts from introducing aquatic invasive species to Alaska and more specifically, the Cook Inlet region, due to the proposed Lease Sale 244 and its associated activities. Also, for further guidance, please see Section 2(a) of Executive Order 13112 (also codified in Federal Regulations) which specifies Federal Agency duties with respect to invasive species. Please develop mitigation measures to (1) prevent the introduction of aquatic invasive species, and (2) detect and respond rapidly to aquatic invasive species introductions, and (3) monitor for non-native species introductions…all potentially stemming from lease sale actions (i.e., limited to the offshore oil and gas industry, not to include other industries such as commercial fishing or military actions). Please identify research BOEM would consider funding on aquatic invasive species and on developing technologies to prevent aquatic invasive species introductions. Please see my suggestions for mitigation measures below.

BOEM asked: Are there any additional mitigation measures BOEM should consider to reduce impacts? What are they?

Yes. One mitigation measure that might prevent or inhibit the introduction of non-native aquatic species is for BOEM to require industry vessels (to include rigs and platforms) to visually inspect the hulls of their vessels for non-native species a week before departing an Outside port for Alaska. This visual inspection should be digitally captured and if, the inspection shows the hull is not fouled with biota, the digital video along with a summary certifying the vessel free of biofouling, should be transmitted to BOEM and/or BSEE for approval to travel to Alaska. If biofouling is discovered on the vessel during the visual inspection, the hull should be cleaned (e.g., by divers) and visually inspected and documented again. Once clean of biofouling, the digital video and summary certifying the vessel's hull is free of biofouling, the documentation should be sent to BOEM and/or BESS for approval to travel to Alaska to work.

Another mitigation for prevent non-native species introductions to Alaska is to require lessees and their contractors to sanitize any equipment used overboard in waters outside Alaska, before its used in Alaska waters.

BOEM asked: Is there anything else you believe BOEM should know to help fully assess the potential impacts from oil and gas activities in Cook Inlet OCS waters?

Representative of Submittals from Jefferson Childs | Document too voluminous to include in FEIS | All documents reviewed and considered

1. Scientific methods, concepts, and knowledge evolve and improve over time. So too should environmental impacts analyses. Significance criteria and impacts analyses should be based on the best scientific information. State of the art impact analysis tools and techniques should evolve and improve over time. In this DEIS, BOEM has not used GIS (an impact analysis tool) fully to assess potential impacts to fish resources and some lower trophic resources. Distribution maps for fish resources and some stationary lower trophic resources (species or populations) are not included in the DEIS, that could be publicly more informative. Such GIS maps should be populated with publicly available scientific data, assessed for its accuracy and precision as the NMFS has done for identifying and mapping EFH, and then spatially and temporally analyzed using the various impact producing factors to accurately and precisely assess the scope of potential impacts. Such use of GIS would enhance the assessments and may yield identification of potential impacts of greater magnitude than presently identified in the DEIS. This is particularly true for large and very large oil spill assessments. Please use GIS in conjunction with fish population/ metapopulation data and large and very large oil spill data, and assess the potential impacts to fish populations (e.g. anadromous species). Please include individual species population distribution and habitat maps juxtaposed with large and very large oil spill spatial distribution scenarios.
2. The impacts scale is overly ambiguous, uses weak definitions that themselves are ambiguous, immeasurable, and somewhat arbitrary. They also suggest that BOEM is regressing, since BOEM-Alaska Region has used more scientifically based and measurable significance criteria in environmental assessments its conducted for lease sales in the last ten years (e.g., Beaufort and Chukchi lease sale EIS's and EA's in the 2000's). BOEM is committed to using the best scientifically available information. As such, a variety of professional biological societies (e.g., American Fisheries Society) and organizations have recommended using the "3 generations threshold" for conducting impacts assessments. I suggest BOEM review the best scientific information available for establishing thresholds for assessing impacts to biological resources and use the best scientifically available thresholds. BOEM should consider holding a national workshop on this issue, particularly so because its wrestled with identifying suitable significance thresholds across regions, plans (e.g., 5 year) and at various levels of NEPA analyses. Please publish the workshop results, if convened.
3. There are flaws also in broadly using biological data (e.g. species distributions, life history and habitat characterizations) when the sampling methodologies are poorly known, understood, or not suitable for combining with other datasets. For example, no information is included in the fish resource baseline information (Ch. 3) on fish surveys conducted in Cook Inlet. What surveys were conducted where, when, and by what methods? Are the results of these different surveys suitable to combine for analysis in GIS? What areas have not been surveyed? When were they surveyed last? How has climate change impacted each fish species and population since last surveyed? How does this information influence the assessments?
4. Data gaps: there are numerous information gaps with respect to baseline information concerning biological resources, yet these are either not identified or poorly identified. NEPA has specific guidance on the quality of information needed and used in impacts assessments. Assessments for biological resources need specifically identify information gaps and needs, how the lack of such information influences the accuracy and precision of the assessments, specifically the conclusions drawn regarding scale and magnitude of impacts, what studies are needed and what the costs would be to gather the data.

Representative of Submittals from Jefferson Childs | Document too voluminous to include in FEIS | All documents reviewed and considered

5. BOEM has known for years this EIS was needed; that detailed biological and ecological data for living resources in the Cook Inlet regions were needed to analyze potential impacts associated with the proposed lease sale. I've pointed out a sample array of information gaps needed to accurately and precisely assess potential impacts to chiefly the fish resources. Nonetheless, there are many more information gaps not identified by BOEM in the EIS. (I will identify more if BOEM will please extend the public comment period for the DEIS for a few more weeks.) Within the DEIS, BOEM lists a few studies pertinent to the Cook Inlet region that it has funded in the last decade. Please identify in the EIS all studies proposed in the last 15 years for the Cook Inlet region with synopses of the studies, the data they would have yielded, how that data was to be used in assessing potential impacts associated with Cook Inlet lease sales (including LS 244) and explain why they went unfunded. Please add all information gaps (as identified in the LS 244 DEIS, via public comments and thru any subsequent impacts analysis) as study profiles to the region's annual study plan and considered for funding.
6. I would like to submit more comments to help improve the impacts analysis and DEIS overall. Please consider extending the public comment period a few more weeks, and I will provide more constructive comments. Thank you for answering my questions and incorporating my comments.

Literature Cited

Carlton, J.T. and G.M. Ruiz. 2005. The Magnitude and Consequences of Bioinvasions in Marine Ecosystems. pp. 123-148. In: Marine Conservation Biology: the Science of Maintaining the Sea's Biodiversity. E.A. Norse and L.B. Soul (eds.) 2005. Marine Conservation Biology Institute. Island Press, Washington.

Critter, J.P. and P.F. Sale. 2006. Marine Metapopulations. Academic Press/Elsevier. New York.

Thorsteinson, L.K. and M.S. Love. 2016. Alaska Arctic Marine Fish Ecology Catalog. U.S. Geological Survey Scientific Investigations Report 2016-5038 (OCS Study, BOEM 2016-048), 768 p., http://dx.doi.org/10.3133/sir20165038.

Mecklenburg, C.W. T.A. Mecklenburg, and L.K. Thorsteinson. 2002. Fishes of Alaska. American Fisheries Society. Bethesda, MD.

PUBLIC SUBMISSION

As of: September 07, 2016
Received: September 02, 2016
Status: Posted
Posted: September 06, 2016
Tracking No. 1k0-8rol-mrjm
Comments Due: September 06, 2016
Submission Type: Web

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0063
Comment from Sarah Stevens, NA

Submitter Information

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General Comment

To Whom it May Concern,

I live on the Cook Inlet in Alaska and on August 15th in Anchorage, I gave an in-person testimony asking for a NO LEASE option in Cook Inlet. In my comments at that time, I quoted many different people in regards to the effect of fossil fuels on global climate change.

Here, I want to provide the quotes and links I used in my testimony along with a few additional quotes. I continue to be a strong opponent of oil & gas leasing anywhere in Alaska! We are running out of time to make the necessary changes to divert the disaster that is climate change. Alaskans DO NOT WANT leases in our Inlet! Please help us ensure a livable planet for our future generations by acting on our commitments to end global climate change and our reliance on fossil fuels.

Bill McKibben Founder of 350.org (in article for the New Republic) titled:
A WORLD AT WAR:: We're under attack from climate changeand our only hope is to mobilize

like we did in WWII.::
"with each passing week, another 22,000 square miles of Arctic ice disappears.
"At an insurance industry conference in April, a federal official described the new data as "an OMG thing." "The long-term effect," The New York Times reported, "would likely be to drown the world's coastlines, including many of its great cities."

(https://newrepublic.com/article/135684/declare-war-climate-change-mobilize-wwii)

According to the Guardian "two members of Congress wrote to Loretta Lynch, the attorney general [..] saying they were concerned by the results of two separate investigations [...] which found that ExxonMobil scientists confirmed fossil fuels were causing climate change decades ago, but publicly embarked on a campaign of denial."
The Guardian also reports "[...] that the oil company's scientists knew that fossil fuels caused climate change as early as 1981 - 27 years before climate change became a public issue."

(https://www.theguardian.com/business/2015/oct/16/exxonmobil-congress-climate-change-federal-investigation)

According to NPR:: 5 Years After BP Oil Spill, Effects Linger And Recovery Is Slow

(http://www.npr.org/2015/04/20/400374744/5-years-after-bp-oil-spill-effects-linger-and-recovery-is-slow)

On Arctic Ocean Acidification:: The colder the water, the more quickly it absorbs carbon dioxide gas, and so the more acidic"
"A recent study calculates that the northern ocean will be the first in the world to hit the point of no return with dangerous systemic acidification. By the end of this decade 10% of the arctic will be so acidic, it will damage rather than foster life."

(http://d2ouvy59p0dg6k.cloudfront.net/downloads/thecircle0410.pdf)

According to Alaska's own Adaptation Advisory Group of the Governor's Sub-Cabinet on Climate Change impacts of climate change include the fisheries Alaskans rely on::
"Communities and industries reliant on marine-based fisheries will be particularly affected, as will individuals and communities dependent on subsistence harvest of marine fish and wildlife as essential elements of their food supply and cultural well-being"

(http://climatechange.alaska.gov/aag/docs/aag_Ch5_27Jan10.pdf)

The EPA has its own assessment of climate impacts on Native Alaskans:
"More than 30 Native villages are either in the process of or in need of relocating their entire village..."
Meanwhile regarding our infrastructure the EPA says that "Uneven sinking of the ground in response to permafrost thaw is likely to add significant costs to the maintenance and repair of transportation infrastructure and buildings.[3]"

(https://www3.epa.gov/climatechange/impacts/alaska.html)

Solutions Project: "Policy change and stronger relationships at the state-level are key to ensuring all people can access the jobs, household budget, and health benefits of clean energy and efficiency."

(http://thesolutionsproject.org/)

Renewable Energy Alaska Project's 2012 Report on Tidal Power:
http://alaskarenewableenergy.org/tag/tidal-energy/
"Waves and tidal currents off Alaska's coastline would generate more than 850 terawatt-hours of electrical energy annually if fully developed, according to two reports recently released by the U.S. Department of Energy. Much of that potential lies untapped in the waters of the Cook Inlet region [...]"
"An Electric Power Research Institute report estimates that there are 2,100 TW of total wave energy off the coasts of the U.S., with over 50% of that potential in Alaska."

(http://alaskarenewableenergy.org/why-renewable-energy-is-important/alaskas-resources/ocean-wave-and-tidal/)

According to the Solutions Project, We would only need wave power to create 1-2% of total renewable energy output for the state Their plan would create 14,662 40 year construction jobs & 15,099 40 year operations jobs
Annual Energy Health & climate cost savings PER PERSON in 2050 will be $27,060

(http://thesolutionsproject.org/infographic/#ak)

PUBLIC SUBMISSION

As of: September 07, 2016
Received: September 02, 2016
Status: Posted
Posted: September 06, 2016
Tracking No. 1k0-8roo-7v7e
Comments Due: September 06, 2016
Submission Type: Web

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0064
Comment from Chelsey Lehnherr, NA

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General Comment

My words echo the thoughts of thousands when I say now is the time to be focusing on solutions to our environmental problems NOT further contributing to them. It would be a mistake for this to take place.

PUBLIC SUBMISSION

As of: September 07, 2016
Received: September 02, 2016
Status: Posted
Posted: September 06, 2016
Tracking No. 1k0-8rop-1d57
Comments Due: September 06, 2016
Submission Type: Web

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0065
Comment from Ray Olson, NA

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General Comment

We must protect our sacred waters and gentle eco systems from further deatruction by foosul fuels. The earth can sustain tge constant abuse

PUBLIC SUBMISSION

As of: September 07, 2016
Received: September 03, 2016
Status: Posted
Posted: September 06, 2016
Tracking No. 1k0-8rot-19ij
Comments Due: September 06, 2016
Submission Type: Web

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0066
Comment from Becky Long, NA

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General Comment

9/2/16

Abigal Ross Hopper, Director
Alaska OCS Region
BOEM

These are comments regarding the draft environmental impact statement on proposed Cook Inlet Oil and Gas Lease Sale 244.

First, I request an extension of the public comment period. This public comment period occurred at the busiest time of the Alaskan year. This is the busy summer season where fishing and tourism businesses must put all their effort into their work.

I am opposed to this proposed lease sale. It is a waste of taxpayer and public time and money to hold this sale particularly since there is low industry interest.

Cook Inlet has wonderful and bountiful renewable energy resources. Oil and gas leasing displaces the opportunity to produce the renewable offshore resources in the outer continental shelf.
The draft EIS did not adequately address the current and future climate change impacts on marine resources. This includes the cumulative impacts of climate change which would occur with the impacts from offshore oil and gas leasing.

I urge you to follow through on the guidelines from the 8/1/16 Memorandum for Heads of Federal Departments and Agencies put out by Christina Goldfuss, of the Council on Environmental Quality. This is the Final Guidance for federal department and agencies on consideration of greenhouse gas emissions and the effects of climate change in National environmental Policy Act Reviews.

As the memo states: "Climate change is a fundamental environmental issue and its effects fall squarely within NEPA's purview." The idea is to quantify the proposed actions projected direct and indirect GHG emissions taking into account available data and GHG quantification tools that are suitable. The NEPA review should consider an action in the context of future state of the environment.

Draft EIS did not adequately address the long term impacts to commercial, sport, personal use, and subsistence fisheries. Nor did it address adequately the impacts to the endangered Cook Inlet beluga whale and its prey species.

Fulfill your mandate and focus on the renewable energy resource production in Cook Inlet. There are innumerable leases for offshore wind turbines on the east coast of the US. That is the direction your agency should be going.

Becky Long

PUBLIC SUBMISSION

As of: September 07, 2016
Received: September 03, 2016
Status: Posted
Posted: September 06, 2016
Tracking No. 1k0-8rp7-vgz4
Comments Due: September 06, 2016
Submission Type: Web

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0067
Comment from jone suleski, NA

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General Comment

Since your environmental studies have been conducted Alaska has experienced a 7.1 earthquake on Jan 24th, 2016; which was the strongest of its kind ever recorded in the Cook Inlet area. The EPA cannot continue on responsibly until new impact studies are done, no lease should be permitted until this is fully researched."

Fracking does not belong close to active salmon streams. All coastal communities are demanding more studies be done before you destroy their livelihoods.

PUBLIC SUBMISSION

As of: September 07, 2016
Received: September 03, 2016
Status: Posted
Posted: September 06, 2016
Tracking No. 1k0-8rp7-bl4o
Comments Due: September 06, 2016
Submission Type: Web

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0068
Comment from brent watkins, NA

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General Comment

Fracking does not belong close to active salmon streams. All coastal communities are demanding more studies be done before you destroy their livelihoods. We had a 7.1 earthquake in January of this year 2016. New 'Impact Statements' must be done before fracking operations start in this volatile area.

PUBLIC SUBMISSION

As of: September 07, 2016
Received: September 04, 2016
Status: Posted
Posted: September 06, 2016
Tracking No. 1k0-8rq1-92zm
Comments Due: September 06, 2016
Submission Type: API

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0069
Comment from sharon whytal, self-employed

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General Comment

Dear Ms. Hopper,
Thank you for taking input on this important topic. Please do the right thing: cancel Lease Sale 244 and pursue renewable power on Alaska's Outer Continental Shelf. Releasing a 600+ page draft EIS in the height of Alaska's subsistence and commercial fishing seasons prevents due process by a large and important group of stakeholders: people who depend directly on the health of the oceans. Of course, we all depend on the ocean's health, but those of us who actively engage and rely on it for our food and/or livelihood are especially aware of the issues. I am grateful we have the Inletkeeper to inform me of such a timeline that occurs in this busy season. Clearly, with the effects of climate change already impacting AK visibly, we need instead to focus our attention on a shift from petroleum to the many other options that AK itself has, which can be safely utilized and not threaten our marine environment: wind, tides, and more. As a healthcare providers, I have seen our recommendations change to limiting halibut intake for pregnant women, PCP warnings for shellfish, and the evidence of POP's in breast milk in the Arctic, which we need to observe closely. You heard many comments at your visit to Homer, where residents have for 4 decades let you know how we feel about the priority of clean water and air, from the many diverse disciplines represented and sharing their facts; please respect citizen input and do the right thing this time. Respectfully, Sharon Whytal

PUBLIC SUBMISSION

As of: September 07, 2016
Received: September 05, 2016
Status: Posted
Posted: September 06, 2016
Tracking No. 1k0-8rqr-kvqt
Comments Due: September 06, 2016
Submission Type: Web

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0070
Comment from Michael O'Meara, self

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General Comment

My previous comments submitted December 5, 2014 still apply. In addition, it seems bad policy for you to pursue this sale in the face of a record low industry interest in multiple, previous offerings in Cook Inlet. This is a significant waste of taxpayer money at a time when it could be better used to benefit the ordinary citizen. BOEM has a mandate to promote renewable energy development. The money wasted on this O&G offering should have been used for that. Sale 244 remains a bad idea. Please cancel it.

BOEM-2014-0001-0070.html[9/7/2016 8:17:53 AM]

PUBLIC SUBMISSION

As of: September 07, 2016
Received: September 06, 2016
Status: Posted
Posted: September 06, 2016
Tracking No. 1k0-8rr7-hna2
Comments Due: September 06, 2016
Submission Type: Web

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0073
Comment from Betty Steinbach, concerned citizen

Submitter Information

Name: Betty Steinbach
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6901 Ellsworth Circle
Fair oaks, CA, 95628
Email: stbach@sbcglobal.net
Organization: concerned citizen

General Comment

I am totally against any oil wells in Cook Inlet. They have major earthquakes now what would this cause. Also the wild life in that area is very important us. I live in California and our whales go up there for the summer. There is nothing more beautiful than seeing the pods of whales in their natural habitat. The salmon and other fish that we get from there is wonderful and could be ruined.

BOEM-2014-0001-0073.html[9/7/2016 8:35:08 AM]

PUBLIC SUBMISSION

As of: September 07, 2016
Received: September 06, 2016
Status: Posted
Posted: September 06, 2016
Tracking No. 1k0-8rr9-hq33
Comments Due: September 06, 2016
Submission Type: Web

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0075
Comment from Robert / Roberta Archibald / Highland, Citizen

Submitter Information

Name: Robert / Roberta Archibald / Highland
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PO Box 2460
Homer, AK, 99603
Email: robert.e.archibald@gmail.com
Phone: 907 235-8214
Organization: Citizen

General Comment

See Attached File

Attachments

BOEM

BOEM-2014-0001-0075.html[9/7/2016 8:43:28 AM]

Abigail Ross Hopper, Director
Bureau of Ocean Energy Management
45600 Woodland Road
Sterling, VA 20166

Re: Draft Environmental Impact Statement for the Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244 (81 Fed. Reg. 47,819 (July 22, 2016), Docket No.BOEM-2014-0001

Dear Director Hopper:

My wife and I attended the public meeting in Homer AK. and expressed our opinion on the Oil & Gas Lease Sale 244. I would like to express our sincere displeasure in the Bureau's decision to deny the request for an extension on comments. A major portion of affected citizens from the Homer area are either out fishing or on vacation. All requests for comments from your agency seem to end at a time, which alienates these folks. This is also true for your Public Meetings.

We concur with comments from Homer's Cook Inletkeeper, Kachemak Bay Conservation Society and the National Resource Defense Council. (NRDC)

The NRDC comments in section 4,5 & 8 expressed our concerns of the lack of consideration and effects to Marine Mammals, Global Warming and Ocean Acidification.

We only support the no action alternative # 2 under which the lease sale will not occur.

BOEM has been tasked by Congress to promote renewable energy. We are already experiencing the catastrophic effects climate change, global warming with ocean acidification fast on it's heels.

We expect our Federal Government and BOEM to be leaders in doing everything possible to counteract these very real disasters and not add to them & make them worse.

The health of our oceans, which are in big trouble, because of so many human caused impacts, depends on your responsible decisions. (Please watch the Documentary "Sonic Seas" which describes the modern perils faced by our oceans.)

We ask you to choose alternative # 2. NO OIL LEASE SALE

Respectfully,

Robert Archibald — PO Box 2460, Homer, AK 99603

Roberta Highland — 907 235-8314

PUBLIC SUBMISSION

As of: September 07, 2016
Received: September 06, 2016
Status: Posted
Posted: September 06, 2016
Tracking No. 1k0-8rr9-95m0
Comments Due: September 06, 2016
Submission Type: Web

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0077
Comment from Amy Christiansen RN, NA

Submitter Information

Name: Amy Christiansen RN
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705 Soundview Ave
705 Soundview Ave
Homer, AK, 99603
Email: justamyc@gmail.com
Phone: 9073994122
Organization: NA

General Comment

Those sea otters you gave a tiny piece of critical habitat too, swim in the ENTIRE lease area. This is NOT protection to a threatened species. Already we here on Cook Inlet have lost so many resourcesthat were readily avialble like razor clams, and halibut. BOTH of these subsistence species + salmon are not even mentioned in your EPIS, and these grounds are important to the life cycles of both species.

Please choose OPTION 2, NO lease.

It is time to move away from Oil and Gas and protect our environment completely from further spills. NO oil company is to be trusted. Especially the newer smaller companies who may be interested, they for sure can be trusted not to spill- they are inexperienced and lack the resources to respond. Human error must be taken into account in this day and age.

The costs are too high.

Besides of which, This oil is not NEW oil. We have known of its existence for many years (since Arco first explored it 30+ years ago) =Now I want to know who is inspecting the OLD ARCO stuff that still exists around cook inlet. I hear there are cracks in holding tanks of undisclosed mixtures of crude,sea water, and fresh water with human wastes, and lord know what chemiccals and gases across the inlet already in place. WHO IS inspecting the long ago abandoned stuff already there, and who is responsible for it when it fails?

Please choose NO OPTION.

Choose to leave it lie, at least for another 30-40 years.. so that our grandchildren can use it if they want or need to. We do not need every drop we can find now. This race for new development is NOTHING but a ploy by Oil Industry to make a few more dollars profit before the days of oil collapse completely on them. I choose to live here. I choose PROTECT my Kenai peninsula and all of Cook Inlet.

If not for me, then for my grandchildren! Short sighted investment opportunities are too risky.

Choose option #2 NO LEASE.

PUBLIC SUBMISSION

As of: September 07, 2016
Received: September 06, 2016
Status: Posted
Posted: September 06, 2016
Tracking No. 1k0-8rra-un4b
Comments Due: September 06, 2016
Submission Type: Web

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0078
Comment from Sally Wills, NA

Submitter Information

Name: Sally Wills
Address:
Box 382
Homer, AK, 99603
Email: sallywills1360@gmail.com
Organization: NA

General Comment

Attn: Abigail Ross Hopper

Please do not allow gas leases in Lower Cook Inlet.

PUBLIC SUBMISSION

As of: September 07, 2016
Received: September 06, 2016
Status: Posted
Posted: September 06, 2016
Tracking No. 1k0-8rra-m79s
Comments Due: September 06, 2016
Submission Type: Web

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0079
Comment from Joe Jacob, NA

Submitter Information

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Address:
P.O. Box 76
17485 Discovery Drive
Clam Gulch, AK, 99568
Email: info@alaskapersonaljourneys.com
Phone: 907/260-6261
Organization: NA

General Comment

To Whom It May Concern,

I reviewed the EIS for proposed lease sale 244 and offer these comments. First, as someone who owns property on the bluff at Clam Gulch, AK, I am very concerned about seismic activity, fracking and their effects on the stability of the bluffs at Clam Gulch. Second, I do not understand why the federal government (your agency) continues to promote drilling for oil and gas when it is clear that we need to stop our dependency on fossil fuels if we are to do anything to minimize the impact of climate change. Personally, I don't think those involved in the writing of the EIS had a clue as what to do about determining the possible effect of burning fossil fuels that might result of any finds from this lease sale. Finally, as someone who owns a nature-oriented guiding business on the Kenai Peninsula, I do not feel that my customers would find drilling rigs in Cook Inlet compatible with their nature-based experience. The EIS was inadequate in considering the negative impact of drilling rigs and the associated activity on the Alaskan visitor's experience. Because of these, I consider the EIS inadequate; and therefore, choose the no leasing/drilling alternative.

Joe Jacob
Alaska Personal Journeys
17485 Discovery Drive
Clam Gulch, AK 99568
907/260-6261

PUBLIC SUBMISSION

As of: September 07, 2016
Received: September 06, 2016
Status: Posted
Posted: September 06, 2016
Tracking No. 1k0-8rrb-iohd
Comments Due: September 06, 2016
Submission Type: API

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0081
Comment from Anne Wieland, individual

Submitter Information

Name: Anne Wieland
Address:
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Email: agpacsu@xyz.net
Organization: individual

General Comment

I am strongly opposed to the Cook Inlet area lease sale 244 ID. There are already more than enough challenges to the Cook Inlet and Kachemak Bay marine ecosystem from tankers, sewage from Anchorage, general cargo shipping without adding an extreme new threat that drilling, production and all the infrastructure that would be required to support such an attempt.

In addition to the endangered Beluga Whale, commercial, sport and personal use fisheries would be further threatened. The very popular Razor Clam fishery has been suspended in the area, leaving only the Poly Creek on west side of the Inlet as a source of these highly desirable mollusks. If there is a spill, and it has been suggested that there is a very likely possibility over time of a spill, the entire remaining Razor Clam population in the Inlet could be wiped out.

Cook Inlet is a very active seismic area. The 6+ earthquake we experienced this past year was centered in Cook Inlet area. If there were drilling equipment and infrastructure in the inlet, they would be very susceptible to damage.

There have been very significant die-offs this past year of Common Murres, Sea Otters, and certain species of whales. These are happening because of changes in the ecosystem, whether by ocean acidification, warming of the water or other factors, allowing drilling for oil and/or gas in Cook Inlet would exacerbate the factors that are causing these significant deaths.

Above all, adding more fossil fuels to the energy consumed in this country would do absolutely NOTHING to

prevent the continuation and increase in global warming.

We must turn our efforts toward Renewable energy sources and away from fossil fuels

Cook Inlet lease sale area 244 ID must not be allowed to go forward!

PUBLIC SUBMISSION

As of: September 07, 2016
Received: September 06, 2016
Status: Posted
Posted: September 06, 2016
Tracking No. 1k0-8rrc-rr78
Comments Due: September 06, 2016
Submission Type: Web

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0084
Comment from Leah Cloud, NA

Submitter Information

Name: Leah Cloud
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Homer, AK, 99603
Email: Leahcloud@yahoo.com
Organization: NA

General Comment

Climate change is being accelerated with continued burning of fossil fuels. There is no need to open up new oil and gas leases in Cook Inlet. Doing so threatens the health and sustainability of the ocean wildlife habitat and surrounding shorelines because oil spills do happen and people and wildlife need clean air and water to live well. It is time to redirect incentives toward renewable energy sources. Tidal and wind energy are especially abundant in Cook Inlet region. Please think about a sustainable future and stop investing and wasting capital and human energy on furthering climate disasters through generation of greenhouse gases.

PUBLIC SUBMISSION

As of: September 07, 2016
Received: September 06, 2016
Status: Posted
Posted: September 07, 2016
Tracking No. 1k0-8rrf-nl0g
Comments Due: September 06, 2016
Submission Type: Web

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0088
Comment from Steve Hughes, NA

Submitter Information

Name: Steve Hughes
Address:
2101 Mt. Augustine Drive
Homer, AK, 99603
Email: kachemaktaz@gmail.com
Organization: NA

General Comment

Please remove the proposed Cook Inlet lease sale from the docket. What's left of its natural habitat and it's surviving residents are far more beneficial to the future of Alaska, our country, and the world than any oil and gas can ever be.

PUBLIC SUBMISSION

As of: September 07, 2016
Received: September 06, 2016
Status: Posted
Posted: September 07, 2016
Tracking No. 1k0-8rre-8bgb
Comments Due: September 06, 2016
Submission Type: Web

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0089
Comment from David Aplin, NA

Submitter Information

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Organization: NA

General Comment

Please find attached my comments regarding the Draft Environmental Impact Statement for the Cook Inlet Planning Area (Sale 244)

Attachments

Comments_Draft EIS for the Cook Inlet_Sale 244

Mr. David Aplin
4290 Shirley Court
Homer, Alaska 99603
davidaaplin@gmail.com

September 6, 2016

VIA REGULATIONS.GOV

Abigail Ross Hopper, Director
Bureau of Ocean Energy Management
45600 Woodland Road
Sterling, VA 20166

Re: Draft Environmental Impact Statement for the Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244 (81 Fed. Reg. 47,819 (July 22, 2016))

Dear Director Hopper:

Thank you for the opportunity to comment on the Draft Environmental Impact Statement for the Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244.

As an 11 year resident of Homer, Alaska I appreciate our Region's dependence on a healthy marine environment. The economy of Homer, Kachemak Bay, and the Cook Inlet region is inexorably tied to a healthy ocean. Our intact marine system provides direct employment and income to hundreds of residents involved in the commercial fishing, charter fishing, and mariculture. Our communities derive millions of dollars in income from visitors who travel to Kachemak Bay and Cook Inlet from across the U.S. and around the world to experience the region's spectacular scenery, abundant wildlife, and unspoiled natural beauty. Economic benefit from these activities radiates throughout the region and the state, supporting the local business including the marine trades, local shops, stores, restaurants, hotels, and B&Bs. Furthermore, many of us have chosen to live here because of the area's natural beauty, rich ocean-connected culture and ecological diversity that allows unmatched opportunities for recreation, education, and personal fulfillment. All of this is at risk from the continued development of fossil fuels and the impacts of increased atmospheric CO2 and climate change.

Well documented impacts of increased atmospheric CO2 include increased wildfires, invasive species, droughts, flooding, loss of glaciers and ice field (and the corresponding changes in freshwater inflow to our oceans), sea level rise, and ocean acidification. Rising temperatures and subsequent impacts are occurring in Alaska and throughout much of the Arctic at levels unequaled elsewhere – including the lower 48 states. After decades of inaction, international leaders have recognized the scientific consensus regarding the causes of climate change. In 2015, the Obama Administration committed to bold steps to reduce the U.S. contribution of atmospheric CO2, notably at the COP21 meeting in Paris and most recently with China at the September, 2016 G20 Summit at Hangzhou, China.

In 2016, at a time when the burning of fossil fuels has been identified as a primary cause of climate change as recognized and embraced by the Intergovernmental Panel on Climate Change and the U.S. Government and in a place where the impacts of human-caused increases in atmospheric carbon dioxide is already negatively impacting Alaska's terrestrial and marine ecology, communities, and economy it is foolhardy to continue to perpetuate the State and Nation's dependence on fossil fuel.

The Draft Sale 244 EIS embraces a "business as usual" approach to resource development and fails to adequately consider potential positive climate impacts of the No-Action Alternative. Further, the Bureau of Ocean Energy Management (BOEM) appears to be ducking its responsibility to support renewable energy development options. For these and other reasons, I strongly urge the Bureau of Ocean Energy Management (BOEM) and the Obama Administration to cancel Sale 244 (Cook Inlet Planning Area) and start over with a new analysis that enlists BOEM's considerable resources toward the development of wind, tidal, and other technologies that would reduce U.S. dependence on fossil fuel and transition to a new, sustainable economy that avoid the worst impacts of offshore oil and gas development and a warming climate. We are at a fork in the road and, as Yogi Berra once advised, we should take it.

While the Administration has introduced policies to reduce U.S. demand for fossil fuel, the Draft Sale 244 EIS would lead one to conclude that BOEM has not embraced this need to transition to renewable/climate friendly energy sources. Experts are now calling on the U.S. government to simultaneously address both domestic consumption and production to meet our carbon budget. A May, 2016 report by the Stockholm Environmental Institute entitled "How Would Phasing Out U.S. Federal Leases for Fossil Fuel Extraction Affect CO_2 Emissions and 2°C Goals?" concludes that phasing out fossil fuel leases on public lands would be one of the most significant new policies the United States could adopt to help meet international climate goals. Specifically, the analysis concludes that, "at some point in the next two decades, there is potentially no need for federal fossil fuels."

Therefore, to reach its aspiration for a <2C increase in global temperature average, the U.S. government should immediately begin phasing out new on and offshore fossil fuel leasing – especially in areas including Cook Inlet where factors including brutal environmental conditions and ecosystem vulnerability make development unacceptably risky. New offshore leases Cook Inlet would open the door to a BOEM guided process whereby oil and gas companies invest millions of dollars to locate, develop, and exploit assets that would ultimately contribute atmospheric CO2 for decades to come. This process would require BOEM and other Federal agencies to expend resources to regulate and monitor that development when the focus of those agencies should be working with regional stakeholders to develop sustainable energy options that do not contribute to a warming planet. Once new leases are awarded, it would be increasingly difficult to curtail production of fossil fuels from these areas as oil companies seek to maximize the profit from their investments.

The climate impacts of a continued business as usual approach to offshore oil and gas leasing in Cook Inlet are not my only concern. The Inlet's tidal range, which exceeds 26 feet, unpredictable ice conditions, and reduced day length during 6 months of the year, would severely limit spill response effectiveness. These conditions, coupled with the lack of proven response technology could threaten ecologically and economically important resources over a broad area. In fact, while the various alternatives outlined in the Draft EIS consider exclusion or mitigation for areas including critical habitat for Steller sea lion, Cook Inlet Beluga whale, and North Pacific Sea otter, as well as lands and waters managed by Federal agencies or used by local communities for subsistence activities (Chapter 2- Alternatives), the document does not consider the potential movement of oil. This document should include reliable modeling to consider how and where oil would move throughout the marine, estuarine, and terrestrial environments in the event of a spill that occurred during exploration, development or production. Experience with the Exxon Valdez spill in 1989 demonstrated the power of Alaska's wind and tides to distribute oil over vast areas in relatively short order. Cook Inlet/Kachemak Bay fish and wildlife species that would be particularly vulnerable to oil spills including:

- Outbound smolt and/or returning adults of Alaska's 5 species of pacific salmon. Of special concern are the Kenai and Anchor River populations of King salmon (Oncorhynchus tshawytscha) whose populations have experienced significant declines over the past decade;
- Shorebirds "refueling" in Kachemak Bay, the mouth of the Kenai River, and other areas during migration to and from Arctic nesting areas;
- Marine mammals, and especially Sea otters who live, feed, and reproduce in the productive waters of Kachemak Bay and Cook Inlet.

Areas especially vulnerable to the impacts of a Cook Inlet Planning Area oil spill include:

- Kachemak Bay Critical Habitat Area - A component of An International Reserve of the Western Hemisphere shorebird reserve Network and The Kachemak Bay National Estuarine Research Reserve;
- Cook Inlet Beluga Critical Habitat – Established in 2011;
- Katmai National Park – Important habitat for brown bear and other wildlife species.

As the 1989 Exxon Oil spill and 2010 Deepwater Horizon spills have shown, the impact of oil spills can result in profound long-term ecological, economic, and social disruption. In Cook Inlet, these risks are compounded by serious threats borne by a warming planet. Unfortunately, the BOEM Sale 244 Draft EIS provides an incomplete analysis of these risks and impacts and perpetuates a "business as usual" approach to resource development in the face of climate change, an issue in which the

President has said "will define the contours of this century more dramatically than any other...(UN Climate Change Summit, September 23, 2014). I therefore urge the Bureau of Ocean Energy Management to cancel Cook Inlet Sale 244 and conduct a new and comprehensive analysis of the need for, potential impacts of, and climate smart alternatives to energy development in Cook Inlet and Alaska that are aligned with the Administration's ambitious goal of reducing the global increase in temperature to well less than 2C.

Sincerely,
Dave Aplin
Homer, Alaska

PUBLIC SUBMISSION

As of: September 07, 2016
Received: September 06, 2016
Status: Posted
Posted: September 07, 2016
Tracking No. 1k0-8rre-vbzu
Comments Due: September 06, 2016
Submission Type: Web

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0093
Comment from Amy Christiansen RN, NA

Submitter Information

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Homer, AK, 99603
Email: justamyc@gmail.com
Phone: 907 399 4122
Organization: NA

General Comment

Please extend the comment period for another 30 days at least. This affects all of us here on the kenai peninsula! Humans were not part of your EIS and they should have been!

PUBLIC SUBMISSION

As of: September 07, 2016
Received: September 06, 2016
Status: Posted
Posted: September 07, 2016
Tracking No. 1k0-8rrd-2tgb
Comments Due: September 06, 2016
Submission Type: Web

Docket: BOEM-2014-0001
Oil and Gas Lease Sales: Alaska Outer Continental Shelf; Cook Inlet Planning Area Lease Sale 244

Comment On: BOEM-2014-0001-0024
Environmental Impact Statements; Availability, etc.: Cook Inlet Outer Continental Shelf Oil and Gas Lease Sale 244

Document: BOEM-2014-0001-0094
Comment from Sue Christiansen, NA

Submitter Information

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Phone: 907-299-2946
Organization: NA

General Comment

Thank you for the time and energy you have given to reading these comments. I appreciate this opportunity to speak up in hopes of protecting Lower Cook Inlet waters (oil and gas lease sale 244). These waters have provided for my family and enriched my life for the last 40 years.

I have watched the decline of fisheries and destruction of our marine habitat as a result of oil and gas exploration.

I urge you to consider the long term impacts fossil fuel is having on our environment and make decisions that will benefit generations to come.

Think about the joy you have experienced in the natural world and the young people you love most. Please make it possible for them to experience the extraordinary beauty of lower Cook Inlet, the richness of the sea and the interconnectedness of the many diverse species here.

Many of the negative impacts of oil and gas exploration are just now being understood. Please consider ocean acidification. Added oil will only contribute to this problem. Consider the science that has demonstrated the detrimental impact seismic blasting has on fisheries and marine mammals. If you have ever been involved with oil spill response technology you know it is not all it is cracked up to be, and true protection is lacking. Science acknowledges dispersants cause long term ecological harm, I hope you can acknowledge this also. There are so many navigational safety issues involved, including lack of tug escorts. All these jeopardize the rich, productive waters of lower Cook Inlet.

Oil prices are low currently, there is no need to explore and risk negative impacts to this area at this time.

Our lives and economy depend on these waters. We need you to protect them in every way. Please, do not move forward with oil and gas leasing in lower Cook Inlet.

You have lots of responsibility on your shoulders in making this decision. I trust you will look within, listen to your inner dictates and make a decision that is for the highest good of our planet. Now is your point of power. Thank you for allowing the same energy that guides the birds as they migrate, and brings a little soul into an infant's body - to guide you as you make this decision.

Keeping you in my thoughts and prayers.
Sue Christiansen

APPENDIX G

OCS Oil and Natural Gas: Potential Lifecycle Greenhouse Gas Emissions and Social Cost of Carbon

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OCS Report
BOEM 2016-065

OCS Oil and Natural Gas: Potential Lifecycle Greenhouse Gas Emissions and Social Cost of Carbon

November 2016

U.S. Department of the Interior
Bureau of Ocean Energy Management
Sterling, VA

Suggested citation:

Wolvovsky, E. and Anderson, W. 2016. OCS Oil and Natural Gas: Potential Lifecycle Greenhouse Gas Emissions and Social Cost of Carbon. BOEM OCS Report 2016-065. 44 pp.

Foreword

This report evaluates greenhouse gas (GHG) emissions from oil and gas produced on the Outer Continental Shelf (OCS) of the United States. The Bureau of Ocean Energy Management (BOEM) believes this is the most comprehensive analysis conducted to date by a Federal resource management agency of the GHG emissions associated with the activities it authorizes. This report includes a methodology for analyzing the *full* lifecycle of activities resulting in the release of emissions, beginning with oil and gas exploration and production and ending with consumer use. BOEM intends to continue such public, full lifecycle reporting of GHG emissions in the future, with improvements garnered from feedback on this report and from other information.

The report concludes that America's GHG emissions will be little affected by leasing decisions under BOEM's 2017–2022 OCS Oil and Gas Leasing Program ("2017–2022 Program") and could, in fact, increase slightly in the absence of new OCS leasing. However, given analytical constraints, BOEM assumed that, for purposes of this analysis and the analysis that forms the basis of the 2017-2022 Program, foreign sources of oil will substitute for reduced OCS supply, and the production and transport of that foreign oil would emit more GHGs.

In addition to not fully capturing global market and GHG implications, BOEM recognizes that there is another, broader perspective than what is provided in this report. The Paris Agreement, to which the U.S. is a party, commits its parties to holding the increase in global average temperature to "well below 2° C above pre-industrial levels." The Intergovernmental Panel on Climate Change and other agencies and academics have evaluated what that commitment means for GHG emissions. In short, there is consensus that future global GHG emissions must be kept to about 1 trillion metric tons if global average temperature is to stay under the 2° C Paris Agreement commitment.

Each metric ton of GHG emissions associated with OCS oil and gas activities, or any other source, is a draw on Earth's 1 trillion metric ton emissions budget. Using externally developed estimates of global and U.S. carbon budgets, BOEM estimates that full lifecycle GHG emissions from past OCS oil and gas leasing and the 2017-2022 Program could represent as much as one-half percent of the remaining global carbon budget and potentially could represent up to 9 percent of the remaining carbon budget for the United States. While uncertainty obviously remains in estimating such numbers, it is helpful to provide a sense of scale with regard to the impact of OCS oil and gas development.

These two perspectives yield a wide range of potential GHG emissions that could result from oil and gas produced on the OCS. We welcome input on the approach used in this report in order to improve our analysis going forward.

BOEM is deeply invested in carrying out its statutory mission, balancing the development of domestic energy resources with the protection of our environment, informing decisions about America's energy future, and supporting deployment of alternatives to fossil fuels. In an effort to bring more transparency and awareness around the impacts of our decisions, BOEM offers this report for its methodology, information, and acknowledgement.

Abigail Ross Hopper
Director

William Yancey Brown
Chief Environmental Officer

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Abstract

Anthropogenic emissions of greenhouse gases (GHGs) are the main contributor to climate change. Therefore, the Bureau of Ocean Energy Management (BOEM) analyzes potential GHG emissions when considering the potential environmental impacts of Outer Continental Shelf (OCS) oil and gas exploration and development. As a part of its environmental analyses, BOEM has historically estimated the direct GHG emissions resulting from oil and gas operations on the OCS. With this report, BOEM has developed a new analytical approach to estimate the combined upstream and downstream GHG emissions for OCS oil and gas resources, also known as lifecycle emissions. To better inform the public, this report discloses GHG emissions and the social cost of those emissions from the production, processing, storage, transportation, and ultimate consumption of OCS oil and gas resources that could be produced.

The analytical approach relies on historical consumption patterns, emissions factors, and economic and production estimates. The approach examines emissions from oil and gas produced on the OCS and eventually consumed under past, present, and future BOEM oil and gas leasing programs, as well as under No Action Alternative scenarios in which no new OCS leasing takes place and other domestic and international sources of energy are substituted. Three sets of GHG emissions estimates are considered: (1) emissions associated with the 2017–2022 OCS Oil and Gas Leasing Program ("2017-2022 Program"); (2) emissions from leasing under the 2012–2017 Program, to support the two remaining lease sales in the Program; and (3) emissions associated with development of oil and gas resources under leases prior to the start of the 2017–2022 Program. These three sets of emissions are estimated for different oil and gas price cases. The emissions estimates are subject to a number of assumptions as outlined in this report.

The social cost of carbon (SC-CO_2), an estimate of the monetized damages associated with an incremental increase in carbon emissions, is then applied to the estimated GHG emissions. The SC-CO_2 results are presented over a range of discount rates and displayed in 2017 dollars. A discussion of the uncertainty underlying these SC-CO_2 estimates is provided.

Key findings from this study include the following:

- Most lifecycle GHG emissions are the result of the consumption of oil and gas products.
- The price of oil and gas and volume of production has a large effect on the amount of oil and gas lifecycle GHG emissions.
- The magnitude of emissions and their related social costs are comparable for the 2017-2022 Program and the 2017–2022 Program's No Action Alternative.
- The production of oil and gas from other global sources can be more carbon-intense relative to oil and gas produced on the OCS.
- Absent policy changes or technological advancements, OCS emissions could consume a measurable increment of the remaining worldwide and domestic GHG emissions budget.

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Table of Contents

List of Tables

List of Figures

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Acronyms and Abbreviations

AEO	Annual Energy Outlook
bbl	barrels of oil
bcf	billions of standard cubic feet
BEA	Bureau of Economic Analysis
boe	barrel of oil equivalent
BOEM	Bureau of Ocean Energy Management
^{o}C	degrees Celsius
CH_4	methane
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
DICE	Dynamic Integrated Climate Economy (model)
E&D	exploration and development
EIA	Energy Information Administration
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
^{o}F	Fahrenheit
FUND	Climate Framework for Uncertainty, Negotiation and Distribution
GDP	gross domestic product
GHG	greenhouse gas
GOM	Gulf of Mexico
IAM	integrated assessment model
INDC	Intended Nationally Determined Contributions
IPCC	Intergovernmental Panel on Climate Change
IWG	Interagency Working Group on Social Cost of Greenhouse Gases
kg	kilograms
mcf	thousands of standard cubic feet
mmcf	millions of standard cubic feet
MMbbl	millions of barrels
N_2O	nitrous oxide
NEMS	National Energy Modeling System
NEPA	National Environmental Policy Act
OCS	Outer Continental Shelf
OECM	Offshore Environmental Cost Model
PAGE	Policy Analysis of the Greenhouse Effect
SC-CO_2	social cost of carbon
scf	standard cubic feet
U.S.	United States of America
UERR	undiscovered economically recoverable oil and gas resources
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
USGCRP	United States Global Change Research Program

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1. Introduction

The impact of greenhouse gas (GHG) emissions on the planet has been well documented (IPCC 2014, USGCRP 2014), and increasingly, governments at all levels are seeking to better understand how their decisions contribute to these emissions. The Bureau of Ocean Energy Management (BOEM) currently analyzes air pollutant emissions, including GHGs, every three years from the majority of oil and gas exploration, development, and production activities on the Outer Continental Shelf (OCS) through its Gulfwide Emissions Inventory (BOEM 2014). Future emissions from OCS oil and gas activities have also been estimated in the bureau's National Environmental Policy Act (NEPA) documents. However, the Gulfwide inventory and NEPA documents do not consider GHG emissions from the subsequent onshore processing, storage, distribution, and consumption of produced oil and gas resources.

The goal of this report is to examine the lifecycle GHG emissions associated with OCS oil and gas development activities both pre- and post-production, as well as the potential costs to society from these emissions. As part of this effort, BOEM will: (1) define a methodology for estimating the range of potential future emissions that could result from OCS oil and gas development; (2) estimate and disclose the contribution of future emissions from OCS lands already leased; (3) project a range of emissions that could ultimately result from development associated with both the current (2012–2017) and proposed (2017–2022) OCS Oil and Gas Leasing Programs; and (4) evaluate the social cost of carbon (SC-CO_2) of the 2017-2022 Program. The social cost of these emissions is an estimate of the monetized damages associated with the incremental increase in carbon emissions.

BOEM estimates the range of GHG emissions that are likely to be released during the lifecycle of oil and gas resources originating on the OCS. This includes all operations on the OCS associated with oil and gas leases (exploration, development, and production), onshore processing (refining and storage), delivery of these products to the final consumer, and the consumption of the oil and gas products. For context, BOEM compares these projected emissions to future annual emissions targets agreed to by the U.S. under the recent Paris Agreement, as well as a separately established U.S. emissions goal. Finally, BOEM calculates the anticipated social cost of these emissions by applying widely accepted criteria developed by the Federal government (IWG 2016).

With this report, BOEM is taking an important step toward a more complete disclosure to the public of the contribution of BOEM-permitted OCS oil and gas exploration, development, and production activities to national GHG emissions. This effort has been informed by the Council on Environmental Quality's recently issued *Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews* (Goldfuss 2016). The results of this report will allow BOEM to efficiently fulfill its responsibility to disclose the environmental implications of bureau actions in both planning efforts and NEPA documents.

BOEM estimates GHG emissions, expected to be released starting in 2017, with three different leasing activity subsets: leases to be issued under the 2017–2022 Program, leases that have or will be issued under the 2012–2017 Program, and OCS leases issued before the end of 2017 for all current and previous programs. This approach provides a context to consider the potential domestic and global contribution of OCS oil and gas program GHG emissions, with some insights as to how individual programs contribute to overall GHG emissions.

The results reflect a range of potential outcomes due to uncertainties inherent in energy markets. Among the more noteworthy factors are uncertainties regarding the amount of oil and gas resource potential offshore, uncertainty in future oil and gas price cases and anticipated production, and uncertainty about the future regulatory framework for GHGs that could reduce consumer demand for or supply of OCS oil and gas resources. Nonetheless, the report provides a broad picture of the consequences of OCS oil and gas exploration, development, and production activities.

This report will be revised as new information becomes available. At a minimum, BOEM expects to provide an update to this report within one year and for each subsequent Five-Year Program.

2. Overview of Climate Change

Climate change is broadly defined as the net global increase in temperature and related chemical and physical changes resulting from the release of certain pollutants associated with anthropogenic activities (IPCC 2014). Chief among the drivers of climate change are increasing atmospheric concentrations of carbon dioxide (CO_2) and other GHGs such as methane (CH_4, also known as natural gas), nitrous oxide (N_2O) and several fluorocarbons. Frequently, these emissions are converted into a single number, carbon dioxide equivalent (CO_2e), to reflect the different capacity of these gases to trap heat, as well as their differing atmospheric lifecycles (EPA 2016b). GHG molecules increase positive radiative forcing to alter temperature, humidity, wind, and precipitation patterns globally. The most recent U.S. National Climate Assessment highlights the history of that warming within the U.S., indicating that:

> U.S. average temperature has increased by 1.3°F to 1.9°F since 1895, and most of this increase has occurred since 1970. The most recent decade was the nation's and the world's hottest on record, and 2012 was the hottest year on record in the continental United States. All U.S. regions have experienced warming in recent decades, but the extent of warming has not been uniform. In general, temperatures are rising more quickly in the north. Alaskans have experienced some of the largest increases in temperature between 1970 and the present. People living in the Southeast have experienced some of the smallest temperature increases over this period (USGCRP 2014).

This warming is expected to result in rising sea levels, shrinking glacial coverage, loss of permafrost, and increasing extreme weather such as severe droughts, flooding, and stronger tropical cyclones (IPCC 2014). Other effects of GHGs include increasing oceanic concentrations of CO_2, leading to the acidification of the world's oceans and damage to environmental and cultural resources. Changes in climate regimes are also altering the range over which plants and animals live, by expanding some habitats while shrinking others, and possibly driving some species to extinction. In some regions, human beings are expected to also become displaced, retreating from the coastlines as seas inundate dry land,

and moving away from areas with increasingly hostile climate regimes. Some of these changes, such as the loss of permafrost, release additional GHGs, which accelerate or compound the harms associated with climate change. The U.S. National Climate Assessment describes this future warming as follows:

> The amount of warming projected beyond the next few decades is directly linked to the cumulative global emissions of heat-trapping gases and particles. By the end of this century, a roughly 3°F to 5°F rise is projected under a lower emissions scenario, which would require substantial reductions in emissions, and a 5°F to 10°F rise for a higher emissions scenario assuming continued increases in emissions, predominantly from fossil fuel combustion (USGCRP 2014).

The assessment goes on to describe the effects of this warming across the U.S. Increasing annual rainfall, particularly in the northeast, the Great Lakes, and the southeast, has the potential to cause more frequent flooding. This is in contrast to declining precipitation across Hawaii, which already has scarce freshwater resources. Droughts, oscillating with flooding events, are expected to become more common across the southwest. Melting permafrost in Alaska has the potential to damage or destroy parts of the state's infrastructure.

The world's oceans are also transforming (IPCC 2014, USGCRP 2014). Thus far the ocean has absorbed 90 percent of the heat associated with climate change. As the water absorbs heat, it expands and compounds sea level rise already occurring as a result of melting glaciers and ice caps. This threatens the nation's coasts, but also threatens low-lying areas farther inland, such as the lower Mississippi River basin. The impacts of shifting precipitation, temperatures, and coastlines will substantially impact the nation's agriculture, water resources, human health, energy, transportation, forests, ecosystems, and public and private infrastructure. All of these changes will have an impact on the American economy. Adaptation to these changes will be more difficult for those who have fewer resources, such as poor and minority communities.

3. United States' Greenhouse Gas Emissions

U.S. GHG emissions rose steadily from the industrial revolution through the end of the twentieth century. More recently, U.S. GHG emissions have leveled off, and compared to 2008, emissions have declined (see Figure 1). Substantial additional emissions reductions are needed around the world to avoid the worst impacts of climate change. This is reflected in recent U.S. commitments to reduce emissions under international agreements, as well as the longer-term U.S. goals articulated by the Obama Administration.

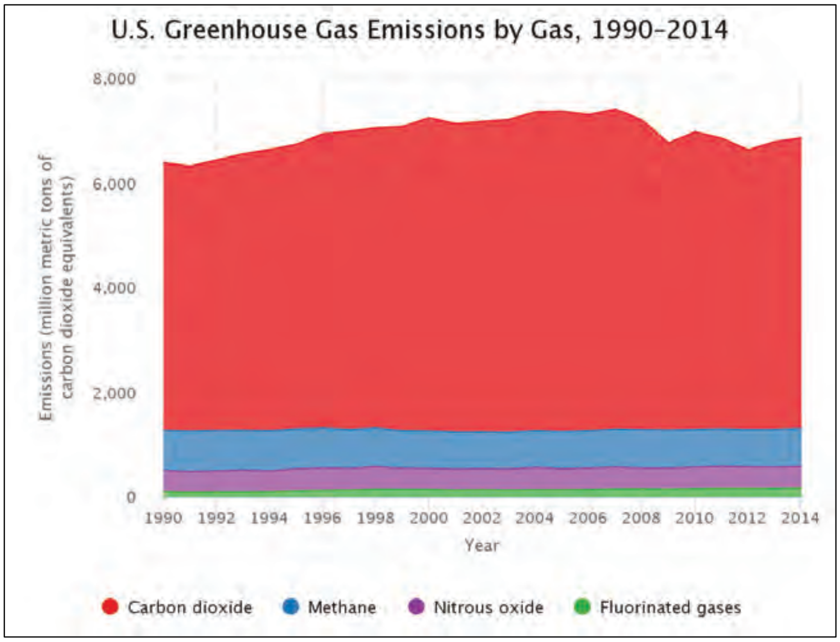

Figure 1. U.S. Total GHG Emissions from 1990 – 2014 (EPA 2016a)

U.S. emissions largely come from the consumption of fossil fuels including oil, natural gas, and coal. These fuels are consumed in different proportions across different economic sectors. The two largest generators of GHGs are electricity generation and transportation, both of which are needed to support the other sectors. GHG emissions from the transportation sector almost entirely originate from petroleum products, with coal and natural gas being the primary sources of GHGs in electricity generation. Oil and gas consumption are also the primary sources of GHGs from residential, commercial, and industrial sectors (see Figure 2).

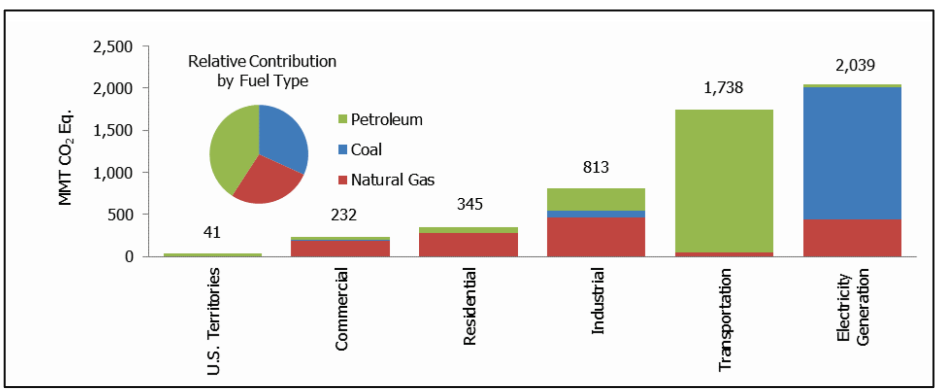

Figure 2. 2014 Greenhouse Gas Emissions by Fuel Type and Sector (EPA 2016a)

On April 22, 2016 (UNFCCC 2016), the United States joined the Paris Agreement, a United Nations' brokered agreement to keep the net global temperature increase to within 2°C (3.6°F) of the pre-industrial level, and preferably within 1.5°C (2.7°F). A recently published study asserts that to keep the planet from warming beyond 2°C (3.6°F), global emissions of GHGs between 2011 and 2050 must be kept below 1,100 million metric tons CO_2e (McGlade & Ekins 2015). It should be noted that the 2°C warming threshold would likely result in drastic changes to the world's climate system (Hansen 2016, IPCC 2014, USGCRP 2014).

The Paris Agreement requires countries to set goals to help stabilize GHG concentrations in the atmosphere at a level that would limit anthropogenic interference with the climate system. The goals are referred to as Intended Nationally Determined Contributions (INDC) (UNFCCC 2016). The United States has set its INDCs using a base year of 2005. In 2005, the United States emitted net emissions of 6,680,300,000 metric tons of CO_2e (EPA 2016a). By 2020, the U.S. intends to reduce its net GHG emissions to 17 percent below 2005 levels. By 2025, the U.S. proposes to have GHG emissions between 26 and 28 percent below 2005 levels. Independent of the Paris Agreement, the U.S. has set a goal to reduce net GHG emissions by 80 percent from 2005 levels by 2050 (White House 2015). As of 2014, U.S. net GHG emissions had declined 9 percent from 2005 levels (EPA 2015). See Table 3-1 for more information on emission reduction goals.

Table 3-1. Historical U.S. Emissions and Emissions Commitments

Year	Net CO_2e Emissions (metric tons)	Reduction from Base Year (%)
2005	6,680,300,000	–
2014	6,108,000,000	9
2020*	5,544,649,000	17
2025*	4,943,422,000 – 4,809,816,000	26 – 28
2050^	1,366,060,000	80

Notes:
* = U.S. emissions commitments under the Paris Agreement
^ = U.S. emissions commitment by the Obama Administration

To achieve these goals, the U.S. assumes a reduction in fossil fuel consumption, changes in agricultural practices and other activities that would mitigate the amount of GHG emissions released. The U.S. also assumes an increase in GHG sinks, which remove GHGs from the atmosphere, using practices like reforestation.

4. Greenhouse Gas Emissions Calculations Methodology

The following analysis includes emissions from the three largest GHGs: CO_2, CH_4, and N_2O. Fluorocarbons are used in very small quantities in refrigeration and in circuit breakers offshore, but are not deliberately released. This makes quantifying them very difficult, but their contribution relative to CO_2, CH_4, and N_2O emissions is very small; moreover, calculating fluorocarbon emissions would suggest the results have a greater degree of accuracy than is currently possible with available data. Additionally, the analysis has been spatially bounded to include emissions from U.S. consumption of OCS oil and gas, along with the substitution of sources for that energy under the No Action Alternative scenario where there is no 2017-2022 Program. The reasoning behind this is the insufficient data available for the kind and proportion of oil products used and a lack of information on overseas energy substitutions. The model estimates the emissions resulting from exploration, development, production, transportation to shore, onshore processing, delivery, and consumption of oil and gas products from the OCS, or their substitutes. This includes all OCS operations, as well as onshore refining, processing, storage, distribution, and consumption. It excludes emissions from secondary changes regarding OCS operations, such as BOEM's and oil and gas companies' office spaces, changes in vehicle fuel efficiency in response to changing market conditions, and others.

The following three subsections detail the approach for estimating GHG emissions. The first subsection addresses emissions released from offshore operations. The second subsection describes scaling emissions released as part of onshore processing and distribution, based on historic emission rates. Lastly, emissions resulting from consumption of petroleum and gas products are calculated using emissions factors and historic consumption patterns.

4.1 Emissions from OCS Exploration, Development, Production, and Transport

BOEM uses the Offshore Environmental Cost Model (OECM) to calculate the environmental and social costs and GHG emissions associated with oil and gas activity occurring on the OCS (BOEM 2015a, 2015b). OECM provides estimates for the monetized impact of typical activities associated with OCS production, including potential oil spills (other than catastrophic oil spills) occurring on the OCS. OECM uses economic inputs, resource estimates, and expected exploration and development scenarios with expected numbers of wells and associated production as the basis for its calculations. GHG emissions from OCS operations are estimated as follows, and a single total emissions number is reported for each of the three major GHGs:

Equation 1:

$$PE_{offshore} = \sum PE_{equipment}$$

$PE_{offshore}$ is the total emissions from offshore production in metric tons
$PE_{equipment}$ are the incremental emissions from using each piece of equipment such as drilling wells, constructing platforms, delivering supplies, and transporting resources to shore.

4.2 Emissions from Onshore Processing, Storage, and Distribution

Once onshore, oil is generally refined into petroleum products for specific uses, such as jet fuel, kerosene, and motor gasoline. A ratio of expected OCS production of crude inputs to refineries is used to scale refinery emissions. Crude oil input data from 2014 (EIA 2016d) are used in coordination with 2014 GHG emissions from refineries (EPA 2016a). The same approach is used for natural gas storage and transmission; a ratio of OCS production and national gas consumption in 2014 (EIA 2016a) is used to scale the U.S. Environmental Protection Agency's (EPA) (2016a) inventory of natural gas systems emissions. It is assumed emissions from these activities are in proportion to the amount of oil and gas that make their way through these processes.

Equation 2.

$$PE_{onshore} = R_{oil}\frac{Oil_{OCS}}{Oil_{Total}} + SD_{ng}\frac{NG_{OCS}}{NG_{Total}}$$

$PE_{onshore}$ is total emissions from onshore processing in metric tons

R_{oil} is total emissions from all oil refining onshore in metric tons (EPA 2016a)

SD_{ng} is total emissions from storage and distribution of natural gas in metric tons (EPA 2016a)

Oil_{OCS} and Oil_{Total} are oil expected to be produced on the OCS, and total U.S. oil refinery inputs in 2014 (EIA 2016d), respectively in barrels (bbl)

NG_{OCS} and NG_{Total} are natural gas expected to be produced on the OCS, and total U.S. natural gas consumption from 2014 (EIA 2016a), respectively in millions of standard cubic feet (mmcf)

This equation is repeated for each of the GHGs being analyzed (CO_2, CH_4, and N_2O). R_{oil} and SD_{ng} are summed from EPA's (2016a) most recent inventory. R_{oil} includes emissions data from the following:

- Table 3-37 (Refining)
- Table 3-39 (Crude Refining)

SD_{ng} includes emissions data (EPA 2016a) from the following:

- Table 3-47 (Processing, Transmission and Storage, Distribution)
- Table 3-50 (Processing, Transmission and Storage, Distribution)

After being refined, oil is primarily transported using oil products as an energy source (EPA 2008). To avoid double counting, motor and other oils estimated in Section 4.3, are assumed to be consumed in proportion to the transportation of OCS oil. For more information on this assumption, see Section 7.

4.3 Emissions from Consumption

All oil and gas is assumed to be consumed in U.S. markets (for details on this assumption see Section 7). To determine the types of petroleum products Americans consume and in what proportion, EIA's (2016b) national 2015 consumption reports are used. A ratio is generated by dividing the national consumption of each petroleum product by overall oil consumption.

Equation 3.

$$C_i = \frac{Oil_i}{Oil_{Total}}$$

Where C_i is the consumption factor for end use of a petroleum product
Oil_i is the national consumption for a petroleum product in bbls (EIA 2016b)
Oil_{Total} is total oil products consumed nationally in bbls (EIA 2016b)

This calculation is repeated for each petroleum product quantified by EIA and is used to generate Table 4-1 below.

Table 4-1. U.S. 2015 Oil Consumption

Petroleum Product	2015 Consumption (1000s of Gallons)	2015 Consumption (% of Total)
Asphalt and Road Oil	5,258,180	1.77
Aviation Gasoline	175,018	0.06
Distillate Fuel Oil	60,999,348	20.52
Jet Fuel (Kerosene Type)	23,574,985	7.93
Kerosene	110,097	0.03
Propane	17,223,255	5.79
Other Liquid Petroleum Gases	19,205,935	6.46
Lubricants	2,069,550	0.70
Motor Gasoline	3,342,396	47.22
Petroleum Coke	127,811	1.81
Residual Fuel Oil #6	94,444	1.33
Other Oil	452,022	6.39

Source: EIA 2016b
Note: Forty-two gallons is equal to 1 barrel of oil

When oil is refined, the volume of product increases as a result of the addition of other ingredients used to make each petroleum product. This volume increase is called the production gain. Currently, EIA estimates production gain to be 6.7 percent across all petroleum products (EIA 2015).

By allocating expected OCS production proportionately, based on the petroleum products and incorporating oil production gain, BOEM can apply EPA's recommended emissions factors for GHG inventories (see Table 4-2). These categories of petroleum products do not match up perfectly between EIA and EPA. In two cases, distillate and residual fuel oils, there are multiple EPA emissions factors for a single EIA product category. In these instances, the amount of oil is evenly split among the possible emissions factors. This is a reasonable approximation since the fuel types are used enough in the U.S. for EPA to have researched and developed emissions factors for each. This does not have a major effect on the overall analysis since the emissions factors for the different distillate and residual fuel oil categories are very similar.

Table 4-2. Petroleum Emissions Factors for Greenhouse Gas Inventories in kg/gallons

Petroleum Product	CO_2	CH_4	N_2O
Asphalt and Road Oil	11.91	0.00047	0.00009
Aviation Gasoline	8.31	0.00036	0.00007
Distillate Fuel Oil #1	10.18	0.00042	0.00008
Distillate Fuel Oil #2	10.21	0.00041	0.00008
Distillate Fuel Oil #4	10.96	0.00044	0.00009
Jet Fuel (Kerosene Type)	9.75	0.00041	0.00008
Kerosene	10.15	0.00041	0.00008
Propane	5.72	0.00027	0.00005
Other Liquid Petroleum Gases	5.86	0.00028	0.00006
Lubricants	10.69	0.00043	0.00009
Motor Gasoline	8.78	0.00038	0.00008
Petroleum Coke	14.64	0.00043	0.00009
Residual Fuel Oil #5	10.21	0.00042	0.00008
Residual Fuel Oil #6	11.27	0.00045	0.00009
Other Oil (> 401°F)	10.59	0.00042	0.00008

Source: EPA 2015

Some oil and natural gas are used as an ingredient for non-combustible products such as fertilizer and petrochemicals; this portion is removed from the consumption calculations since these products are not combusted and their use does not result in GHG emissions. EIA reports that 1.6 percent of all natural gas and 1.2 percent of all oil is never combusted (EIA 2012). Thus, the estimation for emissions from consumption of OCS oil is a summation of the emissions from each distinct petroleum product, as shown in Equation 4 below:

Equation 4.

$$CE_{oil} = PG * CP_{oil}(1 - NC_{oil}) * \sum_{i=1}^{i=n}[C_i * EF_i] * 1{,}000$$

CE_{oil} is total emissions from oil consumption in metric tons
PG is the percent processing gain
CP_{oil} is OCS oil produced in gallons
NC_{oil} is the proportion of oil which is not combusted
C_i is the consumption factor for end use of a petroleum product (ratio, see Equation 3)
EF_i is the emission factor for each petroleum product in kilograms (kg) per gallon.
$_i$ refers to each of the petroleum products listed in Table 4-2.
1,000 converts kg to metric tons

Since natural gas is not refined into other combustible products, there is no processing gain; moreover, there is only a single product to assess even though natural gas is used in different markets. EPA (2015) provides a single set of emissions factors for natural gas (see Table 4-3), making the estimation straight forward, as follows:

Equation 5.

$$CE_{ng} = CP_{ng}(1 - NC_{ng}) * EF_i * 1{,}000$$

CE_{ng} is total emissions from natural gas consumption in metric tons,
CP_{ng} is natural gas produced and consumed in mmcf,
NC_{ng} is the proportion of natural gas that is not combusted in mmcf, and
EF_i is the emission factor for natural gas in kg per mmcf
1,000 converts kg to metric tons

Table 2-3. Natural Gas Emissions Factors for Greenhouse Gas Inventories in kg/scf

Petroleum Product	CO_2	CH_4	N_2O
Natural Gas	0.05444	0.00103	0.00010

Source: EPA 2015

Finally, total emissions, in metric tons, can be summed as E_{total}:

Equation 6.

$$E_{total} = PE_{offshore} + PE_{onshore} + CE_{oil} + CE_{ng}$$

4.4 Emissions from Energy Substitutes

To evaluate the difference between new OCS oil and gas leasing during the 2017–2022 Program and a No Action Alternative (i.e., no new leases in the 2017–2022 Program), BOEM uses information from EIA to estimate energy sources that would be used in absence of the 2017–2022 Program to meet energy demand. The determination of energy substitutes adopts EIA's assumptions that account for current laws, not potential future policies that could reduce emissions. BOEM estimates the GHG emissions that would otherwise be emitted from the other sources of energy Americans could use in place of OCS oil and gas from new leasing. Energy substitution includes meeting energy needs from other sources of oil and natural gas such as production from state submerged lands, onshore domestic production, and international imports. Coal, biofuels, and nuclear and renewable energy sources are substituted for OCS oil and gas in lesser amounts. In addition, it is assumed that there would be some conservation measures, including reduced demand and consumption of all energy sources due to higher oil and gas prices in the absence of new OCS resource availability. To determine the amount of GHG emissions for substituted energy sources, BOEM estimates the lifecycle emissions of the oil, gas, and other sources of energy used to replace OCS oil and gas.

Changes in energy consumption patterns are estimated using BOEM's energy market simulation model, MarketSim (Industrial Economics, Inc. 2015). MarketSim is the same model used to evaluate substitutions in the 2017–2022 Program economic analysis. This model simulates end-use domestic consumption of oil, natural gas, coal, and electricity in four sectors (residential, commercial, industrial, and transportation); primary energy production; and the transformation of primary energy into electricity. MarketSim mostly represents U.S. energy markets, but also captures interaction with world energy markets as appropriate. The model takes current measures of energy production, consumption, and prices assuming no new OCS leasing as a baseline to which a given scenario of OCS production is added. Accounting for substitution between different sources of energy, the model calculates equilibrating prices for oil, natural gas, coal, and electricity based upon the expected increase in OCS production of oil and gas.

For purposes of these GHG calculations, BOEM assumes nuclear, biofuels, solar, and wind sources have negligible GHG emissions at final consumption either because the emissions are small by unit, or because the amount of substituted emissions are less than one percent (BOEM 2015a, 2015b, and 2016). These negligible emissions are not analyzed in this report with one exception. Although coal is expected to substitute for a very small portion of OCS oil and gas (less than one percent in the 2017–2022 Program), its higher rate of GHG emissions per unit of energy makes it worth evaluating. Coal is expected to substitute for natural gas in electrical power generation. BOEM uses EPA's (2015) emissions factors (see Table 4-4) combined with the substitution rate estimated by MarketSim to calculate emissions from coal (see Equation 7).

Table 4-4. Coal Emissions Factors for Greenhouse Gas Inventories in kilograms/million British Thermal Units

Emissions Source	CO_2	CH_4	N_2O
Mixed (Electric Power Sector)	95.52	11	1.6

Source: EPA 2015

Equation 7.

$$C_{cons} = O_{coal} * EF_{coal} * 1000$$

C_{cons} is the emissions from the consumption of substituted coal in metric tons
O_{coal} is the amount of coal replacing OCS products in British thermal units
EF_{coal} is the emissions factor for Mixed Coal (Electric Power Sector) in metric tons per British thermal unit (EPA 2015)
1000 converts kg to metric tons

The overall emissions as a result of substitution are totaled using emissions from exploration, development, production (including tankering), processing, storage and distribution, and consumption of the substituted resources. OECM, the model used to calculate offshore emissions (see Section 4.1), provides similar emissions values for non-OCS production. This includes emissions from oil, gas, coal, and other substituted sources of energy. If the energy, such as oil, is substituted by foreign sources, the GHG emissions released from bringing these products to the U.S. are included.

The summation of production and consumption of substituted sources is reflected in the following equation:

Equation 8.

$$E_{nd} = O_{prod} + CE_{oil} * S_{oil} + CE_{ng} * S_{ng} + C_{cons}$$

E_{nd} is the total emissions from oil and gas consumption when there is no new drilling on the OCS in metric tons
O_{prod} is the total emissions of all substituting sources in metric tons as estimated in OECM
CE_{oil} and CE_{ng} are total emissions from oil (see Equation 4) and natural gas (see Equation 5); consumption is in metric tons
S_{oil} and S_{ng} are the oil and gas substitution rates, estimated by MarketSim
C_{cons} is the emissions from the consumption of substituted coal in metric tons (see Equation 8)

O_{prod} in Equation 8 originates from OECM, which assumes oil production overseas is more GHG-intensive than production on the OCS. For example, CO_2 emissions occurring on the OCS are approximately 0.007759 metric tons per barrel of oil equivalent (boe) versus overseas production, which OECM estimates at 0.036522 metric tons per boe. This relationship between OCS and foreign oil production has been corroborated by other studies (Gordon 2015). To a lesser degree, these higher emissions can also be attributed to OECM assuming two-way trips of tankers bringing oil to the U.S.

To support calculating the SC-CO_2, and to provide a direct comparison between the three different pollutants calculated, BOEM uses Global Warming Potential, also known as CO_2e. The purpose behind converting into a CO_2e is to provide a direct comparison between emissions with different potential to trap heat and different atmospheric lifespans. For example, one metric ton of CH_4 has a similar impact as 25 metric tons of CO_2e. EPA's (2015) conversion factors are used (see Table 4-5).

Table 4-5. Global Warming Potential in Metric Tons

Greenhouse Gas	Global Warming Potential (CO_2e)
CO_2	1
CH_4	25
N_2O	298

Source: EPA 2015

5. Social Cost of Carbon Calculations Methodology

GHG emissions have a cost to the environment and society. In 2010, the Interagency Working Group (IWG) on Social Cost of Carbon developed the original U.S. Government SC-CO_2 estimates. Through the interagency process, the IWG selected SC-CO_2 values for use in regulatory analyses and published their recommendations in February 2010. The SC-CO_2 values are the official Government estimates and represent the best available information for scientific and economic analyses. The IWG, currently called the Interagency Working Group on the Social Cost of Greenhouse Gases, subsequently revised the report in 2013, 2015, and most recently in August 2016 (IWG 2016).

The SC-CO_2 estimates allow agencies to incorporate the social benefits of reducing CO_2 emissions into its decision-making. The IWG defines the SC-CO_2 as the "the monetized damages associated with an incremental increase in carbon emissions in a given year." Monetized impacts include, but are not limited to, changes in net agricultural productivity and human health, property damages from increased flood risk, and the value of ecosystem services due to climate change.

For each emissions year, the IWG recommends four sets of SC-CO_2 values: three values based on the average SC-CO_2 from three integrated assessment models (IAMs)[1], discounted at 2.5, 3, and 5 percent, as well as a fourth value corresponding to the 95th percentile of the frequency distribution of SC-CO_2 estimates at the 3 percent discount rate. Discounting is the process used for determining the present monetary value of future social costs.

As a result of the extensive scientific and economic literature on the potential for lower-probability, higher-impact outcomes from climate change, this fourth value is included to represent results should actual climate change outcomes align with this lower-probability scenario. Presenting this information is important because such outcomes, even if currently presumed to be unlikely, would be particularly harmful to society if realized. Therefore, a consideration of the potential impacts is relevant to the public and policymakers. Table 5-1 summarizes the SC-CO_2 estimates on a metric ton of CO_2e basis in five-year increments for the years 2010 through 2050.

Table 5-1. Social Cost of CO_2, 2010 – 2050 in 2007 Dollars per Metric Ton of CO_2

Discount Rate Year	5% Average	3% Average	2.5% Average	High Impact (95th Pct at 3%)
2010	10	31	50	86
2015	11	36	56	105
2020	12	42	62	123
2025	14	46	68	138
2030	16	50	73	152
2035	18	55	78	168
2040	21	60	84	183
2045	23	64	89	197
2050	26	69	95	212

A number of key uncertainties with the SC-CO_2 estimates remain (IWG 2016). As a result, the current estimates should be treated as provisional because they will evolve with improved scientific and economic understanding. The interagency group also recognizes that the existing models are imperfect and incomplete. A number of analytical challenges are being addressed by the research community, including research programs housed in many of the Federal agencies participating in the interagency

[1] SC-CO_2 estimates are averaged in the Technical Support Document based on the three IAMs: Dynamic Integrated Climate-Economy (DICE), Policy Analysis of the Greenhouse Effect (PAGE), and Climate Framework for Uncertainty, Negotiation and Distribution (FUND). For more information about these models and their underlying uncertainty, refer to the August 2016 Technical Support Document (IWG 2016).

process. The interagency group intends to periodically review and reconsider those estimates to reflect increasing knowledge of the science and economics of climate impacts, as well as improvements in modeling. The National Academies of Sciences, Engineering, and Medicine is expected to release a report in 2017 providing for longer-term recommendations for a more comprehensive update to the SC-CO_2.

The SC-CO_2 estimates in the August 2016 Technical Support Document (Table 5-1) are measured in 2007 dollars. BOEM adjusted these original values to 2015 dollars using the implicit price deflator for gross domestic product (GDP) from the Bureau of Economic Analysis (BEA 2016). For consistency with other recent BOEM economic analysis, including analysis in the 2017–2022 Program, BOEM further adjusted 2015 dollars to 2017 using the projected GDP chain-type price index from the EIA's 2016 *Annual Energy Outlook* (AEO). For years beyond 2050, which are outside the scope of the interagency report (IWG 2016), BOEM derived SC-CO_2 values using the average growth rates for the 2040–2050 period. BOEM then applied the SC-CO_2 values (2017 dollars) to the total CO_2e emissions estimates described earlier in this report. To calculate a present value of the stream of monetary values, BOEM discounted the values in each of the four cases using the specific discount rate that had been used to obtain the SC-CO_2 in each case.

6. OCS Oil and Gas Production Estimates

It is possible, but not particularly efficient, to estimate potential lifecycle GHG emissions at each stage of the OCS oil and gas program: five-year program (national), individual lease sale (region or sub-region), or every exploration and development plan (site-specific or project-scale). Consistent with CEQ's guidance, BOEM has adopted an approach based on the standard of proportionality.

BOEM estimates GHG emissions, expected to be released starting in 2017, associated with three different subsets of leasing activity: (1) leases potentially issued under the 2017–2022 Program including the Proposed Program and Proposed Final Program (also the Preferred Alternative identified in the Programmatic EIS); (2) leases that have been or may be issued under the 2012–2017 Program; and (3) OCS leases issued before the end of 2017 for all current and previous Programs (Table 6-1). This approach provides a broader context to consider the potential domestic and global contribution of OCS Program GHG emissions. The production estimates from the 2012–2017 Program case is entirely included in production expected from all leases issued before the end of 2017.

Table 6-1. Emissions Cases Analyzed

Scenario	OCS Planning Areas Considered				
	Gulf of Mexico	Southern California	Cook Inlet	Beaufort Sea	Chukchi Sea
2017–2022 Proposed Program (emissions after July 2017)	●	–	●	●	●
2017–2022 Proposed Final Program (Preferred Alternative in Final Programmatic EIS) (emissions after July 2017)	●	–	●	–	–
2012–2017 Program (emissions after Jan. 2017)	● (excluding Eastern Planning Area)	–	●	–	–
All Previous and Current Programs (only emissions after Jan. 2017)	●	●	●	●	–

Critical variables to estimate lifecycle GHG emissions include OCS activity levels as well as oil and natural gas produced from the OCS. It is important to note that the majority of GHG emissions will be from the combustion of OCS oil and natural gas produced, as compared to the activities required to explore, develop, produce, transport, process or refine, and distribute oil and natural gas.

Activity levels and production levels for the 2017–2022 Program and 2012–2017 Program cases are derived from exploration and development (E&D) scenarios prepared by BOEM and presented in detail in supporting Programmatic EIS documents (BOEM 2012, 2016a). E&D scenarios describe the potential resources available for leasing and how those potential resources, if found, might be explored and discovered, developed, and produced. The E&D scenarios provide estimates of the types, location, and timing of oil- and gas-related activities and production that could result from a Five-Year Program following lease sales. E&D scenarios are characterized by substantial uncertainty, but are useful to understand the potential GHG emissions that could occur under a given range of possible Program outcomes. Anticipated production estimates reflected in the E&D scenarios represent the portion of undiscovered economically recoverable oil and gas resources (UERR) available on unleased blocks in each of the program areas. UERR refers to that portion of the undiscovered technically recoverable oil and gas resources that could be explored, developed, and commercially produced at given cost and price considerations using present or reasonably foreseeable technology. Activity elements of an E&D scenario include the number of exploration wells drilled, the number of platforms installed, the number of development wells drilled, miles of new pipeline constructed, anticipated aggregate oil and gas production, the number of platforms removed, etc.

It is imperative to realize that E&D scenarios, as well as underlying price assumptions, do not constitute predictions or forecasts. BOEM does not necessarily expect a particular E&D scenario to be realized. Considerable uncertainty surrounds future activity levels and production given geologic risk and economic risk, especially in frontier areas like the Alaska OCS where there is currently no or very limited OCS activity. In some cases, BOEM's E&D scenarios could overestimate activity levels and production. In particular, the E&D scenarios for the Alaska OCS represent a wide range of possible outcomes, from a more probable exploration-only scenario in the Arctic OCS to a more aggressive, but less probable scenario envisioning a substantial build-out of Arctic OCS production operations. However, in these cases the hypothetical E&D scenario is considered so as to understand the potential environmental implications should BOEM leasing activity ultimately lead to such an outcome.

OCS production for the third subset of leasing activity (i.e., future emissions from OCS leases issued prior to and through the 2012–2017 Program) is derived using methods similar to those used by the Energy Information Agency (EIA) in its 2016 AEO (EIA 2016c) and relies in part on EIA data. Special National Energy Modeling System (NEMS) runs provided by the EIA are used to estimate OCS oil and gas production assuming no new leasing after the last sale in the 2012–2017 Program (EIA 2014). Production estimates are provided for the Gulf of Mexico (GOM), Pacific, and Alaska OCS Regions through 2040. EIA's (2014) documentation for NEMS describes the uncertainty inherent in the estimates. The difference between the special NEMS run and EIA's Reference Case in the 2016 AEO is the removal of any assumed OCS production associated with leases issued after the 2012-2017 Program. These special NEMS runs are used as part of the scenario discussed in Section 6.3, which considers all leases issued before the end of 2017. Low- and high- oil price cases (variable price) are also considered where the removal of OCS production beyond the 2012–2017 Program is also considered. In order to provide a complete lifecycle analysis, BOEM extrapolates the potential future OCS production under the special NEMS runs from 2040 through approximately 2075 assuming an aggregated, non-linear OCS production decline curve.

For OCS emissions, corresponding activity levels are not directly estimated because OECM cannot process production estimates without a corresponding E&D scenario. BOEM approximates OCS emissions by assuming a proportional ratio of activity to production (i.e., emissions per production unit). Separate emissions factors are calculated for GHGs across the entire OCS. The emissions factors are calculated as averages across program areas from the OECM results for the 2012–2017 and 2017-2022 Programs. These emissions factors are calculated on a per-barrel of oil basis, and in the case of gas, a barrel of oil equivalent basis.

6.1 2017–2022 OCS Oil and Gas Leasing Program

The 2017–2022 Proposed Program case considers the activities and production from ten lease sales in the GOM and one sale in each of Alaska's program areas: Beaufort Sea, Chukchi Sea, and Cook Inlet. The Proposed Final Program, also the Programmatic EIS's Preferred Alternative, includes the sales in the Cook Inlet and GOM, while excluding the two Arctic lease sales in the Beaufort and Chukchi Seas. The Programmatic EIS describes the potential range of OCS activities and production that could be possible over the 40 to 70 year life of the 2017–2022 Program (BOEM 2016a). BOEM considers production levels at low-, mid-, and high-price scenarios (Table 6-2). Chapter 3 of the Final Programmatic EIS describes the magnitude and timing of OCS activities and production in detail. The E&D scenarios for the 2017-2022 Program are based on the *Assessment of Undiscovered Technically Recoverable Oil and Gas Resources of the Nation's Outer Continental Shelf, 2016* ("National Assessment") (BOEM 2016b).

Table 6-2. Oil and Natural Gas Production Estimates for 2017–2022 Program

Price Scenario	Price		Program Area: GOM (10 sales)	Program Area: Chukchi Sea (1 sale)	Program Area: Beaufort Sea (1 sale)	Program Area: Cook Inlet (1 sale)	Total Production Comparison: Proposed Program	Total Production Comparison: Proposed Final Program
Low	Oil ($/bbl)	$40	2,106	–	–	84	2,189 MMbbl	2,189 MMbbl
	Natural Gas ($/mcf)	$2.14	5,470	–	–	37	5,507 bcf	5,507 bcf
Mid	Oil ($/bbl)	$100	3,531	2,644	2,295	209	8,680 MMbbl	3,740 MMbbl
	Natural Gas ($/mcf)	$5.34	12,011	1,116	4,029	93	17,250 bcf	12,104 bcf
High	Oil ($/bbl)	$160	5,593	4,231	3,673	335	13,831 MMbbl	5,928 MMbbl
	Natural Gas ($/mcf)	$8.54	22,122	1,785	6,447	149	30,503 bcf	22,271 bcf

Note: Production estimates are based on the 2016 National Assessment of OCS UERR

BOEM also estimates energy substitutes using MarketSim that could occur in the absence of a new Five-Year Program, assuming there are no major changes in energy supply or demand (BOEM 2016c). Major energy substitutes include onshore oil and natural gas, imported oil, and other energy sources (e.g., hydropower, renewable energy). BOEM assumes demand is reduced slightly through reduced energy consumption (Table 6-3). These substitution rates are used in the comparative No Action Alternative analysis for the 2017–2022 Program.

Table 6-3. Energy Substitutes assuming no 2017–2022 Program

Energy Sector	Percent of OCS Production Replaced	
	Low	High
Total Onshore Oil and Natural Gas Production	28%	26%
Oil	3%	3%
Natural Gas	25%	22%
Production from Existing State/Federal Offshore Leases	1%	1%
Total Imports	61%	63%
Oil Imports	60%	63%
Gas Imports	0 %	0%
Coal	< 1%	< 1%
Electricity from Sources other than Coal, Oil, and Natural Gas	1%	1%
Other Energy Sources	3%	3%
Reduced Demand/Consumption	7%	7%

6.2 2012–2017 OCS Oil and Gas Leasing Program

The 2012–2017 Program case considers the activities and production from ten lease sales in the GOM (five Western Planning Area sales and five Central Planning Area sales) and a single sale in the Cook Inlet. The two lease sales held in the GOM Eastern Planning Area are not considered because no bids were received on the lease sales. The 2012–2017 Final Programmatic EIS describes the potential range of OCS activities and production that could be possible over the 50-year life assumed for the 2012-2017 Program (BOEM 2012). BOEM considers oil and natural gas production corresponding to the same low-, mid-, and high-price scenarios considered in the 2012–2017 Final Programmatic EIS (see Tables 6-4 and 6-5 for production estimates). Chapter 4 of the Final Programmatic EIS describes the magnitude and timing of OCS activities and production volume in detail. The E&D scenarios for the 2012-2017 Program is based on the 2011 National Assessment (BOEM 2011). Two other activity and production cases in the GOM are also evaluated, given that the 2012 E&D scenarios for the Program are likely overly optimistic when considering the lower levels of current Program leasing activity witnessed through actual lease sale results and in light of recent market conditions.

Table 6-4. Production Estimates for the 2012–2017 Program

Price Scenario	Price		Area: GOM Western Planning Area / Central Planning Area Only (10 sales total)	Area: Cook Inlet (1 sale)	2012–2017 Program Total
2012–2017 Low	Oil ($/bbl)	$60	2,796 MMbbl	100 MMbbl	2,896 MMbbl
	Natural Gas ($/mcf)	$4.27	12,105 bcf	0 bcf	12,105 bcf
2012–2017 Low Adjusted	Activity levels and OCS production reduced by 50% in the GOM to account for lower oil and gas prices and commensurately reduced leasing levels.				
2012–2017 High	Oil ($/bbl)	$160	5,310 MMbbl	200 MMbbl	5,510 MMbbl
	Natural Gas ($/mcf)	$11.39	23,659 bcf	680 bcf	24,339 bcf
2012–2017 High Adjusted	Activity levels and OCS production reduced by 50% in the GOM to account for lower oil and gas prices and commensurately reduced leasing levels.				

Note: Production estimates are based on the 2011 National Assessment of OCS UERR

Table 6-5. Production Estimates for OCS Leases Issued through the 2012–2017 Program

Scenario		Gulf of Mexico, Pacific, and Alaska OCS Production
AEO 2016 *Low Oil Price Case* (extrapolated to 2075)	Oil	17,381 MMbbl
	Natural Gas	29,493 mcf
AEO 2016 *Reference Case* (extrapolated to 2075)	Oil	18,536 MMbbl
	Natural Gas	35,330 mcf
AEO 2016 *High Oil Price Case* (extrapolated to 2075)	Oil	19,223 MMbbl
	Natural Gas	38,350 mcf

Note: Production estimates are based on Special NEMS runs considering OCS UERR from the 2011 National Assessment.

6.3 OCS Oil and Gas Activities and Production on Leases Issued Before the End of 2017

This case considers future production after January 2017 in the GOM OCS, Southern California Planning Area, Beaufort Sea Planning Area, and Cook Inlet Planning Area (potential Lease Sale 244) on leases issued up through the 2012-2017 Program lease sales. OCS production under existing leases at the end of the 2012–2017 Program is keyed to the 2011 National Assessment (BOEM 2011). The production estimate in this dataset also includes the 2012-2017 Program described in Section 6.2. This estimate is based on different economic inputs and should not be directly or explicitly compared to the other two production scenarios.

7. Key Assumptions

This analytical model makes a number of assumptions, which could reduce its accuracy; the assumptions are characterized here. The principal variable in this estimation is the production estimates of OCS oil and gas; the underlying uncertainty in the estimates of the amount of oil and gas to be produced has a profound impact on overall accuracy. These production estimates are a critical input into MarketSim and OECM, models which in turn necessarily rely on a series of assumptions. Other critical assumptions that affect the GHG emissions estimates are as follows:

1. Near constant demand is assumed over the next 40–70 years for oil and gas.

This analysis uses a projection of near constant demand over the next 40–70 years using the 2016 AEO Reference Case, for which EIA does not assume any future changes in laws or policies other than what is incorporated in existing laws and policies. As countries, including the U.S., address climate change with individual policy targets, this assumption could no longer hold. Additionally, as new energy sources become more economically feasible, they could displace existing sources and/or alter the composition of energy supply. The Reference Case is the best baseline currently available. This analysis could be adapted in the future to incorporate policy shifts that affect demand for oil and gas.

2. Engines used for production, processing, and consumption of oil and gas will not become more efficient, and oil and gas will remain a primary energy source.

Historically, engines have become increasingly efficient both in the offshore and onshore environments, but those engines by and large have remained dependent on fossil fuels. Moreover, the *President's Climate Action Plan* (White House 2013) calls for energy and transport efficiency improvements, including transitioning from more intense GHG energy sources. One of the key tenets of the *President's Climate Action Plan* is the reduction of methane from oil and gas production facilities. Efficiency improves through the need for greater economy, and also through Government regulation. These changes could alter the fuel type or quantity of oil and gas used to generate power. Similar changes will impact other types of oil and gas products, such as lubricants and plastics. These changes will alter more than just the amount of oil, but the portion of each barrel being consumed by any sector. For instance, in 2015, motor gasoline represented 47 percent of all oil products by volume. As battery technologies continue to improve, plug-in electric vehicle prices could continue to drop (Nyvist and Nilsson 2015), and the percent of oil used for motor gasoline could drop as the share of electric vehicles increases. However, as the American electrical grid is increasingly dependent on natural gas, such shifts could increase demand for those resources.

Figure 3 shows how consumption patterns of oil have changed in the past, including the rise of jet fuel and motor gasoline use, and the contraction of residual fuel oil use. Despite these longer-term shifts, petroleum products maintain a reasonable level of continuity from year to year. For example, motor gasoline, the largest consumed petroleum product, has never exceeded 47 percent (2015) of total consumption, nor has it dropped below 39 percent (1980) since 1950. During that entire time, it remained the largest petroleum product consumed by Americans.

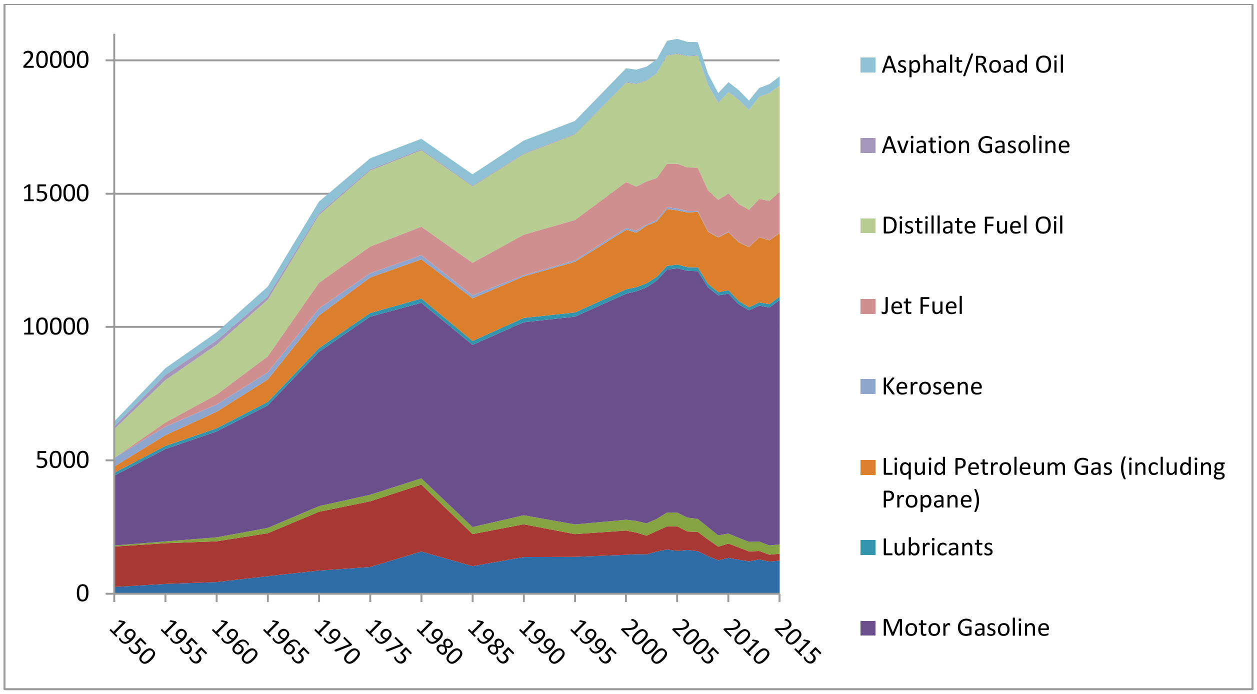

Figure 3. Historical U.S. Average Consumption per day of Petroleum Products by Year (1950 – 2015) in Thousands of Barrels (EIA 2016b)

Without a definitive method of estimating oil consumption and petroleum markets for the coming 70 years, it is impossible to predict how oil and gas consumption will change. Using 2015 data still provides a useful approximation of consumption because the consumption patterns have not radically changed over the short-term. Longer-term trends could be incorporated by keeping the model up-to-date with consumption patterns. It is likely that efficiency will continue to improve, meaning less oil and gas will be required to generate the same amount of energy. This also affects upstream calculations, including the offshore exploration, development, and production, and onshore processing, storage, and distribution. This impacts both the evaluation of OCS activities, as well as energy substitutions, thereby still allowing a user to directly compare emissions.

These assumptions are necessary because it is uncertain how oil consumption will change in the future. However, this assumption is reasonable because of the historical stability in proportionality of petroleum product consumption.

3. All oil and gas on OCS leases is produced, processed, and consumed.

This analysis assumes all the oil and gas expected to be discovered on the OCS is produced, processed, and consumed. In reality, some oil and gas is lost, either by not being brought to production, or through inefficiencies at various stages of processing and distribution or other incidents, such as spills. These results assume that all oil removed from the OCS makes its way through to a customer and is consumed with perfect efficiency. This assumption is currently the only way to conduct this analysis currently; however, it ensures emissions will not be underestimated. Petroleum products that are not combusted are accounted for in this analysis.

4. ‘Other’ oils, distillate fuel oil, and residual fuel oil are approximated.

There are several places where EIA’s consumption categories do not match with EPA’s emissions factors. Since EIA groups pentanes, petrochemical feedstocks, naptha-type jet fuel, still gas, waxes, and crude oil into a single ‘Other’ category, EPA’s ‘Other Oil (> 401^{o}F)’ emissions factors are used. Similarly, EPA has two emissions factors for ‘Residual Fuel Oil’ and three for ‘Distillate Fuel Oil,’ but EIA reports distillate and residual fuel oils broadly. As a result, it is assumed there is equal consumption for each emissions factor, with half of residual fuel oil using each EPA emissions factor, and a third of oil for each distillate fuel oil emission factor. These assumptions reduce the model’s accuracy. See Table 4-2 for both residual and distillate fuel oil emissions factors. This assumption is necessary given the uncertainty of how these fuels are consumed, but it is reasonable given how similar EPA’s emissions factors are for each petroleum product with multiple emissions factors.

5. Production gain is equal across all petroleum products and steady over time.

Production gain is the increase in volume as oil is refined into petroleum products. Although all petroleum products have a production gain, it is not the same for each product. Currently, EIA (2015) estimates production gain as 6.7 percent, but that will likely change in the future. This assumption is necessary given the lack of available information regarding the production gain of individual fuels.

6. All oil and gas is consumed domestically.

Emissions from the export of U.S.-produced oil and gas are relatively minor compared to the amount produced, processed, and consumed domestically. This assumption slightly underestimates the emissions from transportation of these products to other countries. Since emissions factors for natural gas do not vary, if they are consumed overseas, their emissions factors remain the same. However, since oil is consumed in a variety of products, which have a wide range of emissions factors, there is some loss in accuracy for petroleum products consumed overseas, since other counties do not consume these products in identical proportions to the U.S. Even with the loss of accuracy, approximating global emissions from oil using the United States as the example provides a reasonable example of oil consumption. These assumptions are reasonable given the small amount of oil and gas products exported (EIA 2016e).

7. OCS oil is refined into the same petroleum products and consumed in the same proportions as oil and gas nationally.

It is likely OCS oil is refined into specific petroleum products, and those products are not in the same proportions as oil from all sources. However neither BOEM nor EIA have information specifically identifying what petroleum products OCS oil is refined into, and in what proportions. Should more specific information about the type of products OCS oil is refined into become available; the analytical model would be adjusted to accommodate such information. This assumption is necessary given the current lack of information.

8. Oil transportation is powered with oil in proportion to the overall production.

According to the EPA (2008), the vast majority of transporting oil to market is powered with petroleum products. It is therefore assumed this oil is consumed in proportion to the oil produced from the OCS. Since this oil is already accounted for as part of the consumption calculations, there is no additional attempt to incorporate these emissions separately, which would result in double counting these emissions.

9. The percent of oil and gas that remains un-combusted is the same as 2011.

Since EIA (2012) has not updated their non-combusted use of fossil fuels since 2011, this is the most up-to-date information available. Similar to other assumptions, this no-change assumption reduces the overall accuracy of the analysis.

10. The reduction in foreign consumption of oil and gas in a no action analysis is not taken into account.

Although MarketSim estimates a foreign reduction in consumption, MarketSim provides the reduction for oil only. MarketSim does not model natural gas fluctuations in the global market. However, for the global oil market, MarketSim substitutions under the No Action Alternative show a reduction in foreign oil consumption of approximately 1, 4, and 6 billion barrels of oil for the low-, mid-, and high-price scenarios, respectively, over the duration of the 2017–2022 Program. GHG impacts for this reduction in oil consumption, as well as possible changes for natural gas, are not captured in this analysis.

The implications for oil and gas production in other countries relating to U.S. decisions about issuing leases are highly uncertain. In the substitution analysis based on MarketSim, the assumption is made that other oil producing countries will supply oil for U.S. import without additional restraints due to GHG-related policies in those countries. This might change in the future if other countries establish policies to achieve their GHG-related targets.

Excluding the foreign oil and gas markets is reasonable. Oil consumption in each country is different, and BOEM does not have information related to which countries would consume less oil. This is important information since consumption patterns vary by country. For gas consumption, BOEM does not have information related to how changes in the U.S. market would affect other countries.

8. Results

The approach described in Sections 4.1 – 4.3 is applied to the three different OCS program scenarios discussed in Section 6. The approach described in Section 4.4 is applied to the No Action Alternative, meaning not issuing new leases, to the 2017–2022 Program. The SC-CO_2 is calculated using the method described in Section 5. All GHG emissions estimates for each price case in all three scenarios are provided in Appendix A.

8.1 Emissions and Social Cost of Carbon from the 2017–2022 Program

This scenario evaluates the oil and gas emissions and SC-CO_2 on leases that could be awarded during the 2017–2022 Program (see Section 6.1).

8.1.1 Emissions from the 2017–2022 Program

The emissions resulting from the proposed leases and the alternative sources of energy consumed are provided in the three different price scenarios in Table 8-1. Results are presented for the OCS Program Areas considered in the Proposed Program and Proposed Final Program. The Proposed Final Program, also the Preferred Alternative in the 2017–2022 Final Programmatic EIS, excludes leasing in the Arctic OCS. Both are considered to support the NEPA analysis for the 2017–2022 Program.

Table 8-1. Estimated Emissions from the 2017–2022 Program and the No Action Alternative in Thousands of Metric Tons of CO_2e

Area	Low-Price Scenario		Mid-Price Scenario		High-Price Scenario	
	Program	No Action	Program	No Action	Program	No Action
Beaufort Sea	120	0	1,073,570	1,122,120	1,985,070	2,019,670
Chukchi Sea	20	0	1,380,500	1,405,400	1,943,310	2,043,210
Cook Inlet	39,480	40,620	97,620	150,570	156,820	240,930
Gulf of Mexico	1,245,920	1,258,110	2,282,770	2,243,740	3,801,480	3,719,880
Total Proposed Program	***1,285,540***	***1,298,730***	***4,834,450***	***4,957,430***	***7,886,680***	***8,020,550***
Total Proposed Final Program / Preferred Alternative	***1,285,400***	*	***2,380,390***	*	***3,958,300***	*

Notes: Emissions estimates have been rounded to the nearest 10,000 metric tons. Numbers may not add up due to rounding.
Key: * = The estimated distribution (%) of substitutions for the Proposed Final Program would be slightly different than those under the Proposed Program. The gross emissions estimates should be similar to the No Action Alternative under the Proposed Program.

In the case of the Proposed Program, the emissions in the Beaufort and Chukchi Seas are only from exploration activities since no production is expected under a low-price scenario. With no actual production expected under this scenario, there would be no production to substitute, resulting in zero emissions. Using estimated timing of production and offshore activities, it is possible to distribute the GHG emissions for each price scenario. A graph for each price scenario for the Proposed Program and the No Action Alternative scenarios is provided in Figure 4.

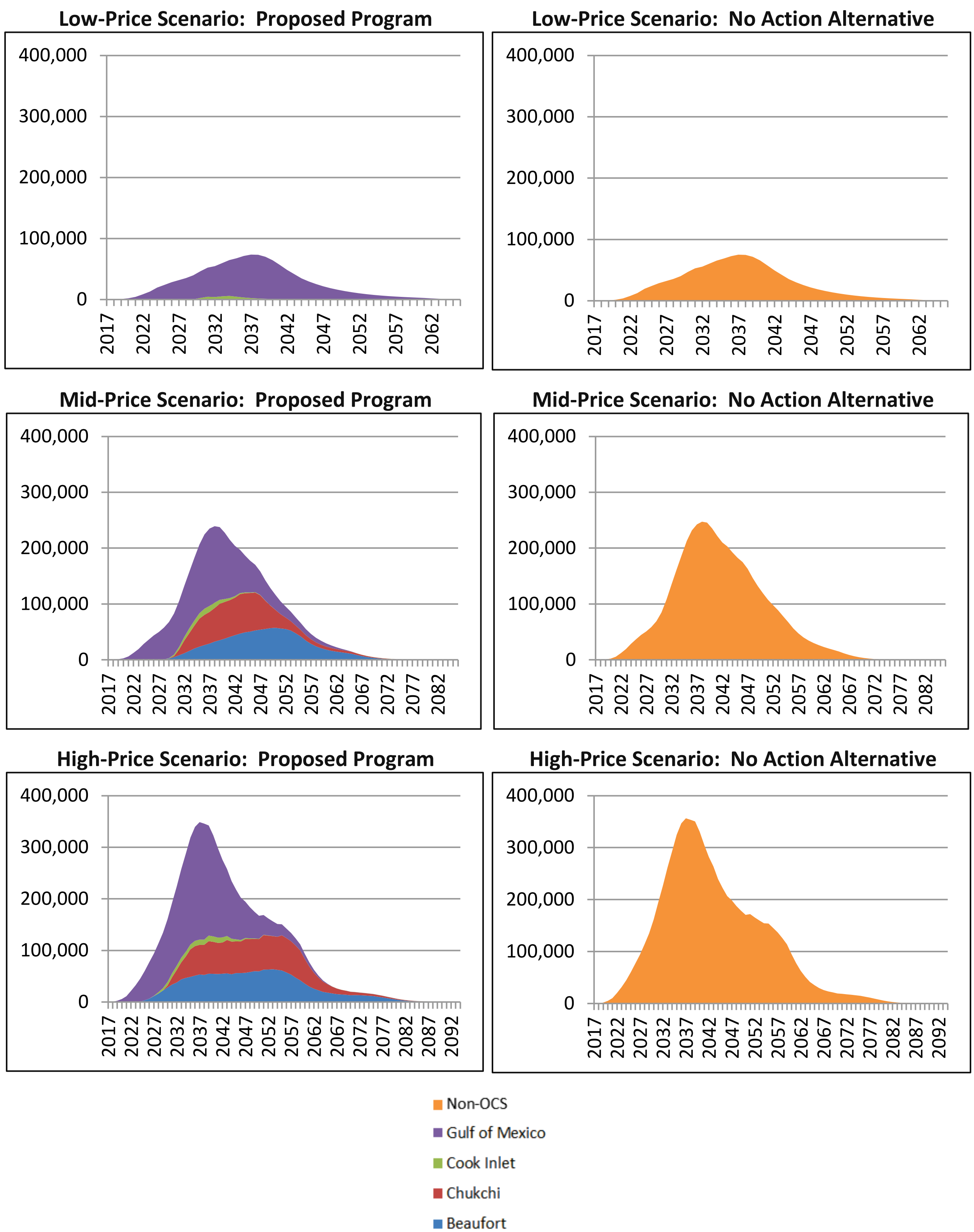

Figure 4. Estimated GHG emissions for the 2017–2022 Proposed Program (*left*) and No Action Alternative (*right*) where oil and gas is recovered from other sources, including substitution of other sources of energy such as coal. Emissions are distributed over time in thousands of metric tons of CO_2e.

The United States has pledged to reduce emissions by filing an INDC with the United Nations as part of the Paris Agreement (See Section 3 and Table 3-1). Tables 8-2 and 8-3 provide a comparison of the U.S. GHG reduction commitments to the estimated OCS oil and gas lifecycle emissions for the high- and low-price scenarios in those specific years. Since the 2017-2022 Program did not exist in 2005 and 2014, these lines are blank, but are included to show both the base year (2005) for measuring U.S. GHG emission commitments and the most recent U.S. GHG inventory available (2014), respectively. The percentages illustrate the proportion of the total U.S. GHG commitments that would be represented by OCS-related emissions if the BOEM production scenarios are ultimately realized.

Table 8-2. Estimated Emissions from the 2017–2022 Proposed Program and the No Action Alternative in Thousands of Metric Tons of CO_2e

Year	U.S. GHG Commitment[a]	Low-Price Scenario				High-Price Scenario			
		Proposed Program [d]		No Action Alternative		Proposed Program [d]		No Action Alternative	
		CO_2e	%	CO_2e	%	CO_2e	%	CO_2e	%
2005[b]	6,680,300	–	–	–	–	–	–	–	–
2014[b]	6,108,000	–	–	–	–	–	–	–	–
2020	5,544,649	2,030	0.05	1,660	0.03	5,880	0.11	5,040	0.09
2025	4,943,422	23,930	0.48	24,180	0.49	60,240	1.22	59,890	1.21
	4,809,816		0.50		0.50		1.25		1.25
2050[c]	1,336,060	13,820	1.03	13,808	1.03	167,210	12.52	170,700	12.78

Notes: Estimates are rounded to the nearest 10,000 metric tons. Percentage refers to the percent of U.S. Commitment.
[a] U.S. commitments in later years assume many changes in policy, many of which have not yet fully formulated; in contrast, the 2017-2022 Program does not take into account any future policy, or other changes that could assist the U.S. achieve those commitments that has not yet been implemented.
[b] The U.S. commitments column shows historical data for 2005, which shows the base year for U.S. GHG reduction commitments, and 2014, which shows the most recent U.S. GHG emissions inventory.
[c] Meeting these commitments is expected to require substantial changes in the U.S. energy market. These changes could reduce the amount of oil and gas being produced or GHG emissions from OCS production, and consequently reduce the amount of CO_2e emissions released from the consumption of OCS resources. This table does not account for such changes, as BOEM lacks the necessary information about specific policies not yet fully formulated.
[d] This includes all program areas, including the Arctic leases. Under the low-price scenario, there is no Artic production, but under the high-price scenario, Arctic emissions represent approximately 50 percent of the Program's emissions.

However, it is critical to acknowledge that meeting the U.S. commitment for 2050 is expected to require substantial future changes in Government policies to reduce domestic oil and gas demand, most of which have yet to be fully formulated. In contrast, the emissions estimates for the 2017–2022 Program do not take into account such future policies or other changes[2] that could assist the U.S. in meeting its commitments. Since new Government policies could take a variety of forms, it is difficult to assess how they would affect OCS production. As specific policies are adopted, it would become possible to adapt the model to account for these changes. See Section 7 for information on assumptions made about future demand.

[2] Transformative technological changes (e.g., rapid U.S. consumer adoption of electric vehicles) also have the potential to contribute to meeting U.S. emissions targets. Such changes, if realized, are likely to be driven by some combination of market forces and Government actions.

Table 8-3. Estimated Emissions from the 2017–2022 Proposed Final Program in Thousands of Metric Tons of CO_2e

Year	U.S. GHG Commitment[a]	Low-Price Scenario: Proposed Final Program [d]		High-Price Scenario: Proposed Final Program [d]	
		CO_2e	%	CO_2e	%
2005[b]	6,680,300	–	–	–	–
2014[b]	6,108,000	–	–	–	–
2020	5,544,649	2,030	0.05	5,880	0.11
2025	4,943,422	23,910	0.48	56,870	1.15
	4,809,816		0.50		1.18
2050[c]	1,336,060	13,820	1.03	45,160	3.38

Notes: Estimates are rounded to the nearest 10,000 metric tons. Percentage refers to the percent of U.S. Commitment.
[a] U.S. commitments in later years assume many changes in policy, many of which have not yet fully formulated; in contrast, the 2017-2022 Program does not take into account any future policy, or other changes that could assist the U.S. achieve those commitments that has not yet been implemented.
[b] The U.S. commitments column shows historical data for 2005, which shows the base year for U.S. GHG reduction commitments, and 2014, which shows the most recent U.S. GHG emissions inventory.
[c] Meeting these commitments are expected to require substantial changes in the U.S. energy market. These changes could reduce the amount of oil and gas being produced or GHG emissions from OCS production, and consequently reduce the amount of CO_2e emissions released from the consumption of OCS resources. This table does not account for such changes, as BOEM lacks the necessary information about specific policies not yet fully formulated.
[d] The Proposed Final Program only includes lease sales in the Gulf of Mexico and Cook Inlet Program Areas, excluding lease sales in the Artic Program Areas.

The proportion of emissions from oil and gas is also not constant across the different price cases (see Figure 5). Under the high-price scenario, the GHGs emitted from onshore processing and consumption of oil is proportionately higher relative to gas compared to the low-price scenario.

8.1.2 Social Cost of Carbon from the 2017–2022 Program

To calculate a present value of the stream of monetary values, BOEM discounted the values for the 2017–2022 Program in each of the four cases using the specific discount rate that had been used to obtain the SC-CO_2 in each case. Tables 8-4, 8-5, and 8-6 provide these net present value results for the Program and No Action Alternative cases for each of the three price scenarios[3].

[3] In the Proposed Program and Proposed Final Program, BOEM analyzes three different price scenarios: low-, mid-, and high-prices. The low-price scenario is $40/barrel of oil and $2.13/thousand scf of natural gas. The mid-price scenario is $100/barrel of oil and $5.35/thousand scf of natural gas. The high-price scenario is $160/barrel of oil and $8.54/thousand scf of natural gas. All price scenarios represent a constant, inflation-adjusted price throughout the life of the 2017-2022 Program.

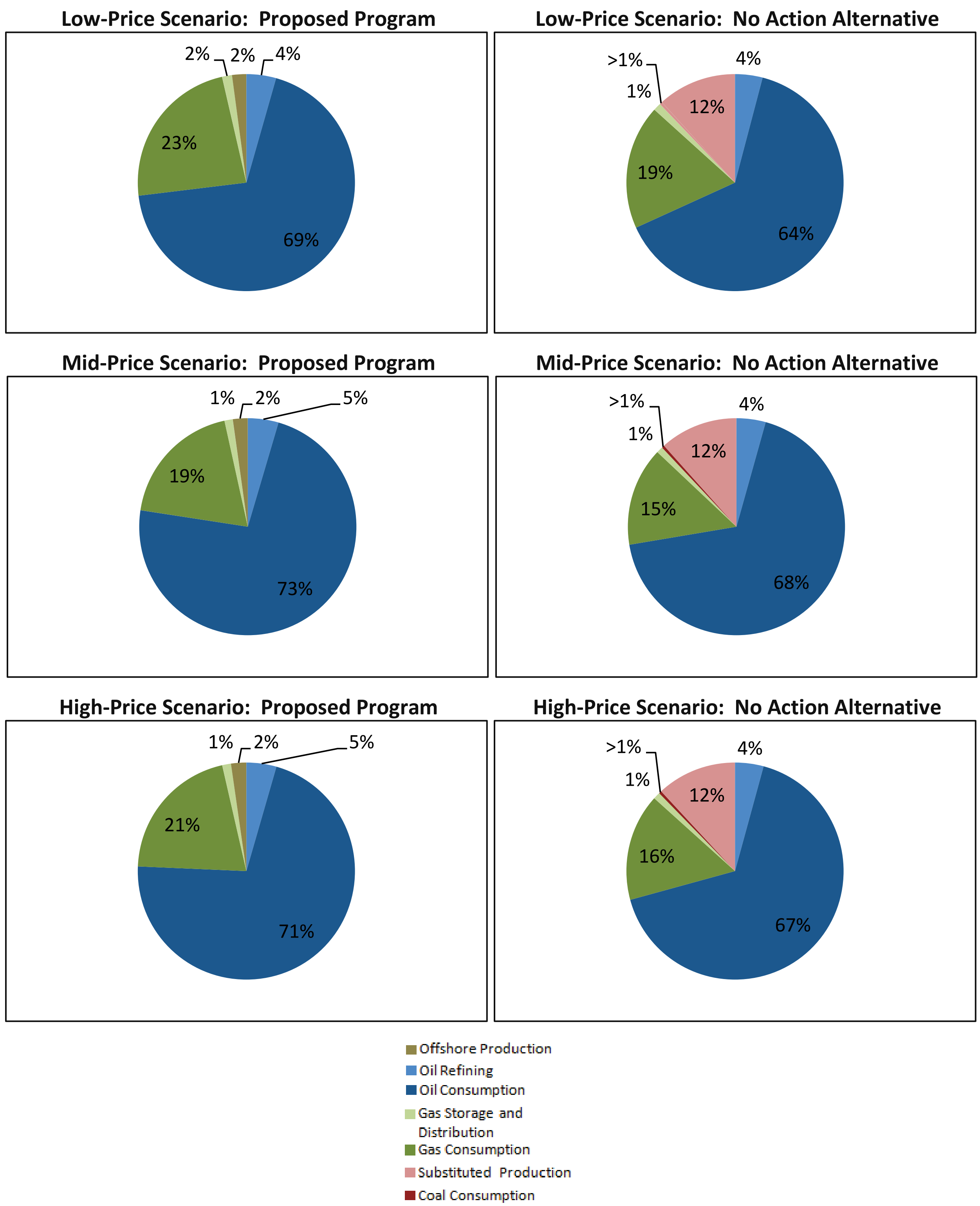

Figure 5. Estimated CO_2e Emissions by Source for the 2017–2022 Proposed Program (*left*) and the No Action Alternative (*right*), as a Percent of Total. The Offshore Production category includes operations occuring on the OCS, which produce oil and gas. The Oil, Gas, and Coal Consumption categories only include emissions from the final consumption of the resource. These ratios represent the Proposed Program, which includes the Arctic lease sales. The Proposed Final Program does not include Arctic lease sales.

Table 8-4. SC-CO_2 Results for the Low-Price Scenario in Dollars

Social Cost of Carbon for Program and No Action Alternative (Low-Price Case)				
Discount Rate	**$ billions**			
	Program Area	**Program**	**NAA**	**Net Difference**
5.0%	Beaufort Sea	0.00	0.00	0.00
	Chukchi Sea	0.00	0.00	0.00
	Cook Inlet	0.34	0.34	-0.01
	Gulf of Mexico	10.10	10.20	-0.10
	Total Proposed Program	***10.44***	***10.55***	***-0.11***
	Total Proposed Final Program	***10.44***	***	***
3.0%	Beaufort Sea	0.00	0.00	0.00
	Chukchi Sea	0.00	0.00	0.00
	Cook Inlet	1.46	1.49	-0.02
	Gulf of Mexico	44.54	45.00	-0.46
	Total Proposed Program	***46.01***	***46.49***	***-0.48***
	Total Proposed Final Program	***46.01***	***	***
2.5%	Beaufort Sea	0.01	0.00	0.01
	Chukchi Sea	0.00	0.00	0.00
	Cook Inlet	2.29	2.32	-0.04
	Gulf of Mexico	70.00	70.73	-0.72
	Total Proposed Program	***72.30***	***73.05***	***-0.75***
	Total Proposed Final Program	***72.29***	***	***
3.0% 95th Percentile	Beaufort Sea	0.01	0.00	0.01
	Chukchi Sea	0.00	0.00	0.00
	Cook Inlet	4.45	4.53	-0.07
	Gulf of Mexico	135.69	137.10	-1.41
	Total Proposed Program	***140.16***	***141.63***	***-1.47***
	Total Proposed Final Program	***140.15***	***	***

Key: * = The estimated distribution (%) of substitutions for the Proposed Final Program would be slightly different than those under the Proposed Program. The gross emissions estimates should be similar to the No Action Alternative under the Proposed Program.

Table 8-5. SC-CO_2 Results for the Mid-Price Scenario in Dollars

Social Cost of Carbon for Program and No Action Alternative (Mid-Price Case)				
Discount Rate	**$ billions**			
	Program Area	**Program**	**NAA**	**Net Difference**
5.0%	Beaufort Sea	7.76	7.99	-0.23
	Chukchi Sea	8.52	8.86	-0.34
	Cook Inlet	0.80	0.83	-0.02
	Gulf of Mexico	18.32	18.65	-0.33
	Total Proposed Program	***35.76***	***36.33***	***-0.93***
	Total Proposed Final Program	***19.12***	*	*
3.0%	Beaufort Sea	38.08	39.20	-1.13
	Chukchi Sea	39.97	41.51	-1.55
	Cook Inlet	3.54	3.64	-0.10
	Gulf of Mexico	81.15	82.61	-1.46
	Total Proposed Program	***162.73***	***166.97***	***-4.24***
	Total Proposed Final Program	***84.69***	*	*
2.5%	Beaufort Sea	61.44	63.25	-1.81
	Chukchi Sea	63.68	66.13	-2.45
	Cook Inlet	5.54	5.70	-0.16
	Gulf of Mexico	127.64	129.93	-2.29
	Total Proposed Program	***258.30***	***265.01***	***-6.70***
	Total Proposed Final Program	***133.18***	*	*
3.0% 95th Percentile	Beaufort Sea	117.01	120.47	-3.46
	Chukchi Sea	122.56	127.30	-4.74
	Cook Inlet	10.79	11.10	-0.31
	Gulf of Mexico	247.35	251.81	-4.46
	Total Proposed Program	***497.70***	***510.67***	***-12.97***
	Total Proposed Final Program	***258.14***	*	*

Key: * = The estimated distribution (%) of substitutions for the Proposed Final Program would be slightly different than those under the Proposed Program. The gross emissions estimates should be similar to the No Action Alternative under the Proposed Program.

Table 8-6. SC-CO_2 Results for the High-Price Scenario in Dollars

Social Cost of Carbon for Program and No Action Alternative (High-Price Case)				
Discount Rate	**$ billions**			
	Program Area	**Program**	**NAA**	**Net Difference**
5.0%	Beaufort Sea	12.49	12.80	-0.31
	Chukchi Sea	12.04	12.49	-0.45
	Cook Inlet	1.26	1.29	-0.03
	Gulf of Mexico	30.49	30.53	-0.05
	Total Proposed Program	***56.27***	***57.11***	***-0.84***
	Total Proposed Final Program	***31.75***	***	***
3.0%	Beaufort Sea	60.78	62.17	-1.39
	Chukchi Sea	59.18	61.36	-2.18
	Cook Inlet	5.58	5.72	-0.14
	Gulf of Mexico	135.08	135.32	-0.24
	Total Proposed Program	***260.63***	***264.57***	***-3.94***
	Total Proposed Final Program	***140.66***	***	***
2.5%	Beaufort Sea	98.07	100.25	-2.18
	Chukchi Sea	95.59	99.09	-3.49
	Cook Inlet	8.78	8.99	-0.22
	Gulf of Mexico	212.48	212.86	-0.37
	Total Proposed Program	***414.93***	***421.19***	***-6.26***
	Total Proposed Final Program	***221.36***	***	***
3.0% 95th Percentile	Beaufort Sea	186.58	190.81	-4.23
	Chukchi Sea	181.86	188.55	-6.69
	Cook Inlet	17.05	17.47	-0.42
	Gulf of Mexico	411.75	412.50	-0.75
	Total Proposed Program	***797.25***	***809.33***	***-12.09***
	Total Proposed Final Program	***428.80***	***	***

Key: * = The estimated distribution (%) of substitutions for the Proposed Final Program would be slightly different than those under the Proposed Program. The gross emissions estimates should be similar to the No Action Alternative under the Proposed Program.

8.2 EMISSIONS FROM THE 2012–2017 PROGRAM

This case evaluates the oil and gas emissions of leases awarded, or to be awarded, during the current (2012–2017) program. Additionally, the original projections for the current program have been adjusted based on the lower levels of leasing activity witnessed through actual lease sale results and in light of recent market conditions (see Section 6.2). The original projections and the adjusted projections were both analyzed and are provided in Table 8-7. Note that this analysis is a subset of the oil and gas leases discussed in Sections 6.3 and data output provided in Section 8.3.

Table 8-7. Estimated Emissions from the Current 2012–2017 Program in Thousands of Metric Tons of CO_2e

Area	Low-Price Scenario		High-Price Scenario	
	Original Current Program	Adjusted Current Program	Original Current Program	Adjusted Current Program
Cook Inlet	43,960	43,960	127,370	127,370
Gulf of Mexico	1,969,160	984,580	3,777,740	1,888,870
Total	***2,013, 120***	***1,028,540***	***3,905,110***	***2,016,240***

Notes: Estimates are rounded to the nearest 10,000 metric tons. Numbers may not add up due to rounding.

8.3 EMISSIONS FROM LEASES ISSUED BEFORE THE END OF 2017

This case includes emissions from the beginning of 2017, considering the oil and gas emissions of all leases awarded before the end of 2017 (see Section 6.3), but only the oil and gas not yet produced as of the start of 2017. Although OCS leases are already issued, or will be by the end of 2017, the emissions analyzed here have yet to occur. This analysis includes existing leases from all OCS planning areas with active leases, including the GOM, Alaska, and Southern California (see Table 8-8).

Table 8-8. Estimated Emissions from OCS Leases Potentially Issued before December 2017 for the Oil and Gas Not Yet Produced in Thousands of Metric Tons of CO_2e

	EIA's Low Oil Price Case	EIA's Reference Case	EIA's High Oil Price Case
Total	9,387,360	10,238,460	10,718,460

Note: Estimates are rounded to the nearest 10,000 metric tons.

Figure 6 shows how the proportion of emissions from oil and gas activities fluctuates for each different EIA oil price case. The proportion of GHG emissions for this scenario is relatively consistent even as prices change. Table 8-9 provides a comparison of the U.S. GHG reduction commitments to the estimated OCS oil and gas lifecycle emissions for EIA's Low and High Oil Price cases in the years identified for U.S. GHG emissions goals.

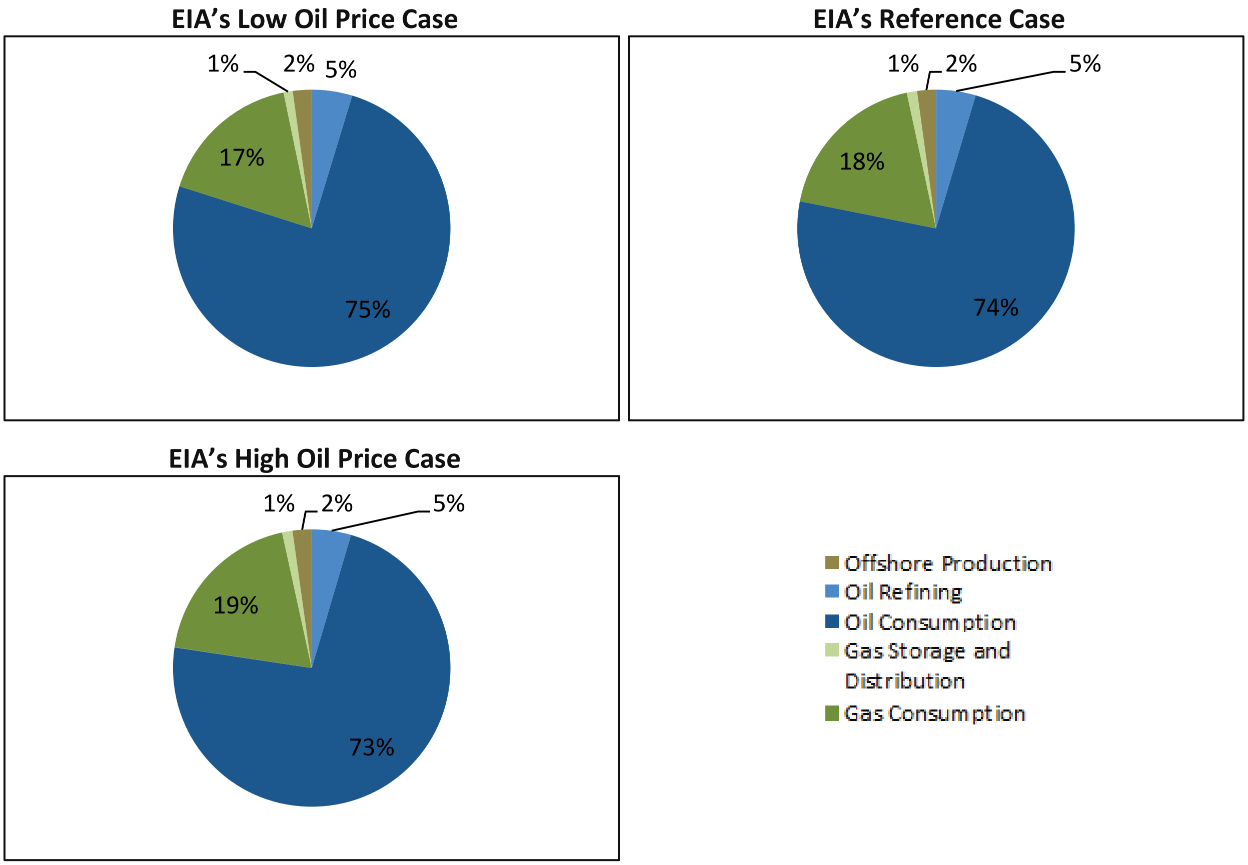

Figure 6. Estimated CO_2e Emissions by Source for Leases Issued Before the End of 2017 as a Percent of the Total. The Offshore Production category includes operations occuring on the OCS, which produce oil and gas. The Oil and Gas Consumption categories only include emissions from the final consumption of the resource.

Table 8-9. Estimated Emissions from all Leases Issued before the End of 2017 in Thousands of Metric Tons of CO_2e

Year	U.S. GHG Commitment[a]	EIA's Low Oil Price Case		EIA's Reference Case		EIA's High Oil Price Case	
		CO_2e	%	CO_2e	%	CO_2e	%
2005[b]	6,680,300	–	–	–	–	–	–
2014[b]	6,108,000	–	–	–	–	–	–
2020	5,544,649	382,320	6.90	387,960	7.00	397,540	7.17
2025	4,943,422	305,900	6.19	328,090	6.64	353,020	7.14
	4,809,816		6.36		6.82		7.34
2050[c]	1,336,060	106,850	8.00	129,100	9.66	133,220	9.97

Notes: Estimates are rounded to the nearest 10,000 metric tons. Percent refers to the percent of U.S. commitment.
[a] U.S. commitments in later years assume many changes in policy, many of which have not yet fully formulated; in contrast, the 2017-2022 program does not take into account any future policy, or other changes that could assist the U.S. achieve those commitments which has not yet been implemented.
[b] U.S. commitments column shows historical data for 2005, which shows the base year for U.S. GHG reduction commitments, and 2014 which shows the most recent U.S. GHG inventory.
[c] Meeting these commitments are expected to require substantial changes in the U.S. energy market. These changes may reduce the amount of oil and gas being produced or GHG emissions from OCS production, and consequently reduce the amount of CO_2e emissions released from the consumption of OCS resources. This table does not account for such changes, as BOEM lacks the necessary information about specific policies not yet fully formulated.

8.4 OCS Emissions Compared to the Global and Domestic Carbon Budgets

By combining expected GHG emissions from past OCS program leasing and those being considered under the 2017–2022 Proposed Final Program, it is possible to describe the potential, incremental use of the remaining global and domestic CO_2e emissions budget. It is important to note that the 2017-2022 Proposed Final Program excludes Arctic OCS leasing.

Table 8-10 uses estimates in McGlade and Ekins (2015), Peters et al. (2015), Gignac and Mathews (2015), IPCC's (2014) Climate Change Synthesis Report, and the International Energy Agency (2015) to estimate the contribution of OCS leasing to the remaining GHG emissions that could be released without exceeding 2°C increase in global temperatures. Since the Program and its substitution emissions are comparable at the scale of consideration, a single table is presented representing both cases. The results show the potential for a meaningful incremental contribution of OCS oil and gas to the remaining global and domestic GHG emissions possible without exceeding 2°C of worldwide warming. The GHG emissions expected to be released after that date are shown in a separate column.

The estimates for global CO_2e emissions not leading to an exceedance of 2°C global temperature increase are in the neighborhood of 1 trillion metric tons, ranging from 768 to 1,180 billion metric tons. BOEM expects emissions from OCS leases already issued, combined with 2017–2022 Proposed Final Program to consume between 0.5 and 1 percent of the remaining global emissions budget. If all Arctic program areas were considered, between 0.5–2 percent of the budget would be consumed. Two analyses allocate a U.S. share of future global CO_2e emissions not leading to an exceedance of 2°C, placing the budgeted U.S. amount between 34 and 123 billion metric tons. BOEM estimates that OCS leases already issued, combined with emissions from 2017–2022 program leases, would consume between 1 and 9 percent of the total U.S. budget. However, there is a considerable amount of uncertainty in estimating these kinds of national emissions budgets given the wide range presented in McGlade and Ekins (2015) and Peters et al. (2015) studies. The estimates from the two studies have an end date of 2050, beyond which only a small amount of additional emissions could be emitted. BOEM's contribution to these additional emissions is listed separately in Table 8-10.

Table 8-10. Emissions from the 2017–2022 Proposed Final Program and Active Leases Issued Before the End of 2017 Compared to Various Carbon Budget Analyses

Carbon Budget Analysis	Timescale	Global Emissions Budget		U.S. Emissions Budget		Post-2050 Emissions
	Years	Billion Metric Tons	Percent Consumed[c]	Billion Metric Tons	Percent Consumed[c]	Billion Metric Tons
Using CO_2e						
McGlade and Ekins (2015)[a]	2011-2050	1,100	0.1 - 0.3%	–	–	0.072– 1
Gignac and Mathews (2015)[a]	2014-onward	1,000	0.1 - 0.4%	78 – 97	1- 5%	–
IPCC (2014)[a,b]	2011-onward	1,000	0.1 - 0.4%	–	–	–
IEA (2015)[a]	2014-onward	880 – 1180	0.1 - 0.5%	–	–	–
Using CO_2 only						
Peters et al. (2015)[a]	2015 – 2050	765	0.2 – 0.4%	34 – 123	1 – 9%	0.071 – 1

Notes: The carbon budget analyses reflect the amount of carbon that can be released without causing warming of more than 2°C. The percent range covers EIA's Low and High Oil Price cases.

[a] Meeting these commitments is expected to require substantial changes in the U.S. energy market. These changes could reduce the amount of oil and gas being produced or GHG emissions from OCS production, and consequently reduce the amount of CO_2e emissions released from the consumption of OCS resources. This table does not account for such changes, as BOEM lacks the necessary information about specific policies not yet fully formulated.

[b] Uses the Complex Model with 66 percent certainty.

[c] To provide the full range of possible outcomes, when a range is provided in the Global and U.S. Emissions Budget columns, the Low Case Budget is compared to the High Case OCS lifecycle emissions, and the High Case Budget is compared to the Low Case OCS lifecycle emissions scenario.

[d] The Peters et al. (2015) paper only evaluated the CO_2 emissions, and so it is compared to only OCS CO_2 emissions.

9. Conclusion

In each price case, and in each scenario for the 2017−2022 Program, U.S. GHG emissions would be slightly higher if BOEM were to have no lease sales, assuming no major market or policy changes. However, the margin is small, and uncertainties in the assumptions could account for the difference, even though assumptions used in analyzing the Proposed Program and the No Action Alternative were the same. Emissions from substitutions are higher due to the exploration, development, production, and transportation of oil from international sources being more carbon-intensive. Even so, the majority of GHG emissions are a result of oil and gas product consumption. As reflected in the analysis, the emissions and associated social costs from the Proposed Program and the No Action Alternative are relatively similar, in large part due to the assumed substitution of more GHG-intensive oil and gas sources in the absence of a new OCS leasing program.

In addition, the estimates for the 2017−2022 Program do not take into account any future policy or technological adaptations; therefore, the U.S. GHG emissions originating from OCS production become proportionately larger if U.S. commitments to reduce GHG emissions are achieved. Similarly, the cumulative effect of OCS emissions consumes a meaningful increment of the remaining worldwide and domestic GHG emissions budget. Assuming policies, regulations, and other factors to reduce GHG emissions continue to be implemented, these changes would affect the production and consumption of oil and gas, produced on the OCS in similar ways to energy produced elsewhere.

Future changes in climate or other policies, supply and demand, shifting economic circumstances, or technological advances could substantially affect the assumptions and results of this analysis. Such changes could affect the GHG emissions from each scenario, price case, and the No Action Alternative for the 2017–2022 Program.

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Appendix A – Additional Greenhouse Gas Emissions Tables

Table A-1. Estimated Emissions from Leases Issued before December 2017 for the Oil and Gas Not Yet Produced, in Thousands of Metric Tons Rounded to the Nearest 10,000

	Low-Price Scenario			Mid-Price Scenario			High-Price Scenario		
	CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	CO_2	CH_4	N_2O
Total	**9,183,490**	**7,350**	**70**	**10,010,160**	**8,270**	**70**	**10,476,900**	**8,760**	**80**

Note: Numbers may not add up due to rounding.

Table A-2. Estimated Emissions from the Current 2012–2017 Program in Thousands of Metric Tons Based on the Original Projections Rounded to the Nearest 10,000

Area	Low-Price Scenario			High-Price Scenario		
	CO_2	CH_4	N_2O	CO_2	CH_4	N_2O
Cook Inlet	43,260	20	0.4	124,070	120	0.8
Gulf of Mexico	1,905,540	2,400	10	3,656,330	4,570	20
Total	**1,948,800**	**2,420**	**10**	**3,780,400**	**4,680**	**20**

Note: Numbers may not add up due to rounding.

Table A-3. Estimated Emissions from the Current 2012–2017 Program in Thousands of Metric Tons based on Revised Projections Rounded to the Nearest 10,000

Area	Low-Price Scenario			High-Price Scenario		
	CO_2	CH_4	N_2O	CO_2	CH_4	N_2O
Cook Inlet	43,260	20	0.4	124,070	120	0.8
Gulf of Mexico	996,030	1,200	6	1,828,170	2,290	10
Total	**974,400**	**1,220**	**6**	**1,952,240**	**2,410**	**10**

Note: Numbers may not add up due to rounding.

Table A-4. Estimated Emissions from the 2017–2022 Proposed Program in Thousands of Metric Tons Rounded to the Nearest 10,000

Area	Low-Price Scenario			Mid-Price Scenario			High-Price Scenario		
	CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	CO_2	CH_4	N_2O
Beaufort Sea	120	0	0	1,055,980	600	10	1,944,570	1,450	10
Chukchi Sea	20	0	0	1,354,290	930	10	1,913,350	1,020	20
Cook Inlet	38,800	20	0.3	96,010	55	0.8	156,200	90	1
Gulf of Mexico	1,218,630	990	10	2,228,140	2,000	20	3,708,070	3,450	24
Total	**1,257,570**	**1,010**	**10**	**4,734,420**	**3,600**	**30**	**7,720,190**	**6,010**	**54**

Note: Numbers may not add up due to rounding.

Table A-5. Estimated Emissions from the 2017–2022 Proposed Final Program, or Preferred Alternative in the Final Programmatic EIS, in Thousands of Metric Tons Rounded to the Nearest 10,000

Area	Low-Price Scenario			Mid-Price Scenario			High-Price Scenario		
	CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	CO_2	CH_4	N_2O
Cook Inlet	38,800	20	0.3	96,010	55	0.8	156,200	90	1
Gulf of Mexico	1,218,630	990	10	2,228,140	2,000	20	3,708,070	3,450	24
Total	**1,257,430**	**1,010**	**10**	**2,324,150**	**2,055**	**21**	**3,864,270**	**3,540**	**25**

Note: Numbers may not add up due to rounding.

Table A-6. Estimated Emissions from the 2017–2022 No Action Alternative in Thousands of Metric Tons Rounded to the Nearest 10,000

Area	Low-Price Scenario			Mid-Price Scenario			High-Price Scenario		
	CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	CO_2	CH_4	N_2O
Beaufort Sea	0	0	0	1,073,360	1,840	10	1,913,510	3,380	10
Chukchi Sea	0	0	0	1,356,220	1,840	10	1,969,070	2,770	20
Cook Inlet	38,830	70	0.3	146,590	150	0.9	234,250	250	1
Gulf of Mexico	1,195,640	2,390	10	2,131,810	4,290	15	3,523,170	7,570	30
Total	**1,234,480**	**2,460**	**10**	**4,751,510**	**8,130**	**40**	**7,636,860**	**13,980**	**60**

Note: Numbers may not add up due to rounding.

Appendix B – Unit Conversions

Unit Conversions	
1 kilogram (kg)	1,000 metric tons
1 metric ton	0.907185 short tons
1 barrel (bbl)	42 gallons
1 million barrels (MMbbl)	1,000,000 barrels (bbl)
1 thousand cubic feet (mcf)	1,000 standard cubic feet (scf)
1 million cubic feet (mmcf)	1,000,000 standard cubic feet (scf)
1 billion cubic feet (bcf)	1,000,000,000 standard cubic feet (scf)
1 barrel of oil equivalent (boe)	5,620 standard cubic feet (scf) gas

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The Department of the Interior Mission

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in island communities.

The Bureau of Ocean Energy Management Mission

The Bureau of Ocean Energy Management (BOEM) promotes energy independence, environmental protection, and economic development through responsible, science-based management of offshore conventional and renewable energy.