

EXECUTIVE SUMMARY

1.0 INTRODUCTION

The National Marine Fisheries Service (NMFS) and the Bureau of Ocean Energy Management (BOEM) have prepared this Environmental Impact Statement (EIS) to describe the effects of offshore oil and gas exploration activities in the U.S. Beaufort and Chukchi seas. This EIS analyzes a range of management alternatives to assist NMFS and BOEM in carrying out their statutory responsibilities to authorize or permit these activities within the five year period of 2012 through 2017.

The statutory responsibilities include BOEM's issuance of permits and authorizations under the Outer Continental Shelf Lands Act (OCS Lands Act) for seismic surveys and NMFS' issuance of incidental take authorizations (ITAs) under Section 101(a)(5) of the Marine Mammal Protection Act (MMPA). A geological and geophysical (G&G) permit must be obtained from BOEM in order to conduct G&G exploration activities for oil, gas, and sulphur resources when operations occur on unleased lands or on lands leased to a third party.

NMFS issues ITAs for oil and gas exploration activities because it is likely that seismic and exploratory drilling activities result in the disturbance of marine mammals through sound, discharge of pollutants, and/or the physical presence of vessels. Because of the potential for these activities to "take" marine mammals, oil and gas operators may choose to apply for an ITA.

1.1 Background

On April 6, 2007, NMFS and the U.S. Mineral Management Service (MMS [now BOEM]) published a Draft Programmatic EIS (DPEIS) that assessed the impacts of MMS' issuance of permits and authorizations for seismic surveys in the Beaufort and Chukchi seas off the coast of Alaska, and NMFS' issuance of ITAs to take marine mammals incidental to conducting those permitted activities. Since the DPEIS was published, new information that alters the scope, set of alternatives, and analyses in the DPEIS has become available. In addition, NMFS determined that an EIS must also address the potential effects of issuing authorizations for take that would occur incidental to exploratory drilling, which were not addressed in the 2007 DPEIS. Therefore, MMS and NMFS filed a Notice of Withdrawal of the DPEIS on October 28, 2009 and announced their decision to prepare a new EIS to be called, *Effects of Oil and Gas Activities in the Arctic Ocean*, with MMS as a cooperating agency. The new EIS would address:

- Effects of both geophysical surveys and exploratory drilling;
- Cumulative effects over a longer time frame;
- A range of more reasonable alternatives consistent with the agencies' statutory mandates;
- A range of practicable mitigation and monitoring measures for marine mammals and their availability for subsistence uses;
- Anticipated levels of G&G activities in the Beaufort and Chukchi seas, Alaska, including:
 - Deep penetration and high-resolution seismic surveys as permitted under 30 CFR Part 551 regulations.
 - Exploratory drilling (in accordance with BOEM and BSEE regulations at 30 CFR Part 550 Subpart B and 30 CFR Part 250 Subpart B, respectively), deep penetration surveys and site clearance and high resolution shallow hazards surveys as authorized under regulations found at 30 CFR 551 as ancillary activities.

1.2 Process

NMFS, as the lead federal agency, prepared this EIS to evaluate a broad range of reasonably foreseeable levels of exploration activities that may occur within the five-year period of 2012 through 2017. BOEM and the North Slope Borough (NSB) are serving as formal cooperating agencies; the Environmental Protection Agency (EPA) is serving as a consulting agency; and NMFS is coordinating with the Alaska Eskimo Whaling Commission (AEWC) pursuant to our co-management agreement under the MMPA.

NMFS has published this EIS to disclose the potential impacts associated with their issuance of ITAs, and invites all interested parties to comment. The EIS will allow NMFS and BOEM to comprehensively assess activities that may occur in a given season before receiving applications. This will allow them to issue permits and authorizations more quickly and efficiently.

A brief summary of the agencies' regulatory requirements follows:

1.2.1 MMPA Requirements

Sections 101(a)(5)(A) and (D) of the MMPA (16 United States Code [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 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. 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.

1.2.2 OCS Lands Act Requirements

The OCS Lands Act, 43 U.S.C. § 1331 *et seq.* prescribes a four stage process for development of offshore federal mineral resources: (1) a 5-year oil and gas leasing program; (2) lease sales; (3) exploration pursuant to exploration plans; and (4) development and production plans. Environmental reviews are conducted for each of these stages.

The OCS Lands Act directs BOEM and the Bureau of Safety and Environmental Enforcement (BSEE) to oversee the “expeditious and orderly development [of OCS resources] subject to environmental safeguards” (43 U.S.C. §§ 1332(3), (6), 1334(a)(7)). Critical to the potential development of OCS resources is the ability to gather geological and geophysical data on the resource potential of the OCS. BOEM, which has rights to all data collected under the OCS Lands Act and implementing regulations, needs the best available data to ensure that the federal government, i.e. the American people, receives fair market value for leased resources. The OCS Lands Act establishes U.S. Department of Interior authority, delegated to BOEM by regulation, to issue G&G permits or notice approvals for G&G, ancillary, and exploration activities, and approve exploratory drilling plans for these and related purposes. BOEM's regulations for G&G permits, ancillary activities, and Exploration Plans are at 30 CFR Parts 551 and 550.

BOEM regulations (30 CFR Part 551) specifically state that G&G activities cannot:

- interfere with or endanger operations under any lease or right-of-way, easement, right-of-use, Notice, or permit issued or maintained under the OCS Lands Act;

- cause harm or damage to life (including fish and other aquatic life), property, or to the marine, coastal, or human environment;
- cause harm or damage to any mineral resource (in areas leased or not leased);
- cause pollution;
- create hazardous or unsafe conditions; or
- unreasonably interfere with or cause harm to other uses of the area.

Pursuant to 30 CFR Part 551.4, a G&G permit must be obtained from BOEM to conduct G&G exploration for oil, gas, and sulphur resources when operations occur on unleased lands or on lands leased to a third party. Ancillary activities are regulated under 30 CFR Part 550.207 through 550.210, which also states that a notice must be submitted before conducting such activities pursuant to a lease issued or maintained under the OCS Lands Act.

1.3 Project Overview

The proposed action considered in this EIS is:

- The issuance of ITAs under Section 101(a)(5) of the MMPA, by NMFS, for the incidental taking of marine mammals during G&G permitted activities, ancillary activities, and exploratory drilling activities in the U.S. Beaufort and Chukchi seas, Alaska, and
- The authorization of G&G permits and ancillary activities in the U.S. Beaufort and Chukchi seas, Alaska, by BOEM under the OCS Lands Act.

This EIS will also evaluate the potential effects to the environment of authorizing takes of marine mammals incidental to such activities occurring in either federal or State of Alaska waters. Activities that could occur in state waters include on-ice and open water seismic surveys, high-resolution site clearance/shallow hazards surveys, and exploratory drilling. The oil and gas exploration activities that are addressed and evaluated in this EIS are grouped into the following three categories:

- Deep penetration geophysical surveys – (e.g. seismic surveys, including open-water, towed streamer 2-dimensional [2D] or 3-dimensional [3D] surveys, in-ice towed streamer 2D surveys, on-ice 2D or 3D surveys or Ocean-Bottom- Receiver [cable or node; OBC] surveys; gravity and gradiometry surveys; and controlled source electromagnetic surveys [CSEM]). These surveys are conducted to identify prospective blocks for bidding in lease sales and to optimize drilling sites on leases acquired in sales.
- Shallow hazards surveys – (also called high-resolution or site clearance surveys) These activities use either acoustic sources to provide imagery of the sub-seafloor to a depth of less than 1,500 meters (0.9 miles), or use sediment sampling devices to identify hazards.
- Exploratory drilling – Any drilling conducted by a lessee to search for commercial quantities of oil, gas, or sulfur authorized under 30 CFR Parts 250 and 550.

The project area (Figure 1.1) covers an area of approximately 200,331 square miles within the Alaskan portion of the Beaufort and Chukchi seas. It includes State of Alaska and OCS waters adjacent to the North Slope of Alaska, and transit areas of the Chukchi Sea north of the Bering Straits.

1.4 Project Purpose and Need

1.4.1 Purpose

The federal actions considered in this EIS are the issuance of G&G permits and ancillary activity notice approvals by BOEM for the Beaufort and Chukchi seas and the issuance of ITAs under the MMPA for G&G surveys, ancillary activities, and exploratory drilling activities in the Beaufort and Chukchi seas by NMFS. ITAs could be issued for these activities in either federal or State of Alaska waters. Given the widespread presence of several species of marine mammals in the Beaufort and Chukchi seas and the nature of oil and gas exploration activities, it is likely that some amount of seismic and exploratory drilling activities may result in the disturbance of marine mammals through sound, discharge of pollutants, and/or the physical presence of vessels. Because of the potential for these activities to “take” marine mammals, oil and gas operators may choose to apply for an ITA.

Sections 101(a)(5)(A) and (D) of the MMPA direct NMFS to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals of a species or population stock 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. Authorization for incidental taking shall be granted if NMFS finds that the taking will have a negligible impact on the affected species or stock(s) and will not have an unmitigable adverse impact on the availability of the species or stock(s) for taking for subsistence uses. NMFS must also prescribe: the permissible methods of taking pursuant to the activity; other means of effecting the “least practicable adverse impact” on the affected species or stock and its habitat and on the availability of such species or stock for subsistence uses; and requirements pertaining to the monitoring and reporting of such taking.

1.4.2 Need

NMFS anticipates receipt of applications to take marine mammals incidental to oil and gas industry exploration activities (i.e. G&G and ancillary surveys and exploratory drilling) pursuant to Sections 101(a)(5)(A) and (D) of the MMPA. This EIS is intended to assist NMFS in its MMPA decision-making process related to projected requests for ITAs in the U.S Beaufort and Chukchi seas for future years and may be revised as necessary. NMFS intends to use this EIS as the required NEPA documentation for the issuance of ITAs for Arctic oil and gas exploration activities. However, if necessary, NMFS may tier from this EIS to support future Arctic MMPA oil and gas permit decisions if such activities fall outside the scope of this EIS.

BOEM anticipates receipt of applications to conduct exploration surveys pursuant to the OCS Lands Act. BOEM intends to conduct site-specific NEPA analyses that either tier from this EIS or incorporate this EIS by reference. To fulfill statutory mandates for proposed exploratory drilling projects, BOEM requires the collection of high-resolution shallow hazards data to: (a) ensure safe operations, which refers to detection of shallow gas pockets, faults, channel boundaries or other geological or man-made features that could be hazards to drilling; (b) support environmental impact analyses; (c) protect resources through avoidance measures, such as prohibiting anchor locations within a boulder patch area or a potential archeological site; and (d) perform other statutory responsibilities.

1.5 Scoping

The scoping period for the *Effects of Oil and Gas Activities in the Arctic Ocean EIS* began on February 8, 2010 and ended April 9, 2010. Public scoping meetings were held during February and March 2010 in the communities of Kotzebue, Point Hope, Point Lay, Wainwright, Barrow, Nuiqsut, Kaktovik, and Anchorage. Scoping comments were received verbally and in writing through discussion, testimony, fax, regular mail, and electronic mail.

Of the issues identified during scoping, those that were most commonly raised included:

- Concerns regarding the NEPA process;
- Impacts to marine mammals and habitats;
- Risks of oil spills;
- Climate change;
- Protection of subsistence resources and the Iñupiat culture and way of life;
- Availability of research and monitoring data for decision-making;
- Monitoring requirements; and
- Suggestions for, or implementation of, mitigation measures.

For more detail on the issues raised during the scoping process, please refer to Appendix C of the EIS.

Executive Order 13175 (*Consultation and Coordination with Indian Tribal Governments*), states that the U.S. Government will “*work with Indian tribes on a government-to-government basis to address issues concerning Indian Tribal self-government, trust resources, and Indian Tribal treaty and other rights.*” For government-to-government consultation during the scoping process for this EIS, Tribal governments in each community, with the exception of Anchorage, were notified of the EIS process and invited to participate. The Tribal Organizations that received invitations to participate are listed below. Native Village of Point Hope declined to participate because they received less than one month of prior notification.

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|---|--------------------------------|
| • Native Village of Nuiqsut | • Native Village of Barrow |
| • Iñupiat Community of the Arctic Slope | • Native Village of Wainwright |
| • Native Village of Point Hope | • Native Village of Kotzebue |
| • Native Village of Point Lay | |

2.0 ALTERNATIVES

A total of nine alternatives were initially considered for this EIS, with the No Action Alternative and four action alternatives carried forward for analysis. The alternatives dismissed and not considered for analysis focused on: permanent closures of areas; caps on levels of activity and/or noise; elimination of duplicative surveys; and zero discharge. Aspects of the dismissed alternatives have been incorporated into the four remaining action alternatives and/or mitigation measures to be considered for analysis.

NMFS and BOEM identified alternatives by:

- Evaluating alternative concepts suggested during the scoping period (such as using alternative technologies to airguns for seismic surveys).
- Reviewing potential alternatives in the context of NMFS and BOEM’s regulatory requirements.
- Assessing potential levels of seismic exploration and exploratory drilling activities, and a suite of Standard Mitigation Measures.
- Identifying a range of potential Additional Mitigation Measures that need further analysis and may be applied to alternatives pursuant to the MMPA ITA process and the BOEM OCS Lands Act permitting process.

Alternatives were developed based on NMFS’ desire to proactively analyze both the effects of multiple exploration activities and effectiveness of mitigation measures, and to anticipate regulatory compliance needs over the timeframe of this EIS.

Past ITAs have been issued for individual G&G surveys, ancillary activities, and exploratory drilling projects in the Beaufort and Chukchi seas in the form of Incidental Harassment Authorizations (IHAs) for periods of no more than one year at a time. This EIS analyzes the effects from multiple oil and gas industry exploration activities, the potential effects of authorizing takes from concurrent activities, and whether the standard mitigation and monitoring measures stipulated in the past are appropriate for current and reasonably foreseeable oil and gas activities. The analysis also includes additional mitigation measures suggested by the public or other agencies.

Based upon past lease sales, G&G permits, ancillary activity notices, exploration drilling exploration activities, and requests for ITAs, NMFS and BOEM have determined a reasonable range and level of activities for which permits and authorizations may be requested in the foreseeable future (i.e. five years [2012 to 2017]). While the level of activity proposed may vary from one year to the next, the action alternatives represent a reasonable range of exploration activities for which permits and authorizations may be requested.

In this EIS, NMFS and BOEM present and assess a reasonable range of G&G, ancillary, and exploratory drilling activities expected to occur, as well as a reasonable range of mitigation measures, in order to accurately assess the potential consequences of issuing ITAs under the MMPA and permits under the OCS Lands Act.

The five alternatives evaluated are:

- **Alternative 1:** No Action
- **Alternative 2:** Authorization for Level 1 Exploration Activity
- **Alternative 3:** Authorization for Level 2 Exploration Activity
- **Alternative 4:** Authorization for Level 2 Exploration Activity with Additional Required Time/Area Closures
- **Alternative 5:** Authorization for Level 2 Exploration Activity with Use of Alternative Technologies

The potential level of activity described by each alternative is based on recent federal and state lease planning and recent industry plans for both seismic surveys and exploratory drilling programs in the Beaufort and Chukchi seas.

For analysis in this EIS, one “program” entails however many surveys or exploration wells a particular company is planning for that season. Each “program” would use only one source vessel (or two source vessels working in tandem, e.g. OBC surveys) or drilling unit (i.e. drillship, jackup rig, SDC, etc.) to conduct the program and would not survey multiple sites or drill multiple wells concurrently. Survey vessels and drilling units are generally self-contained, with the crew living aboard the vessel. For surveys in the Beaufort Sea, support operations would likely occur out of West Dock or Oliktok Dock near Prudhoe Bay. Chukchi Sea surveys could be supported either from Wainwright or Nome. Helicopters stationed at either Barrow (for operations in either the Beaufort Sea or Chukchi Sea) or Deadhorse (for operations in the Beaufort Sea) would provide emergency or search-and-rescue support, as needed.

Site clearance and shallow hazards survey programs are contemplated in each action alternative and typically also include ice gouge and strudel scour surveys and are often referred to as marine survey programs by oil and gas industry operators. The ice gouge and strudel scour surveys do not involve the use of airguns but do involve the use of smaller, higher-frequency sound sources, such as multibeam echosounders and sub-bottom profilers. The area of a site clearance and shallow hazards survey, which is tied to a lease plan, is typically determined by the number of potential, future drill sites in the area. Table 2.4 outlines the typical types of sound sources used in these programs.

Table ES-1 presents a summary of the alternatives.

Table ES-1 Summary of Alternatives

Element	Alternative 1 – No Action	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Level of Activity	No ITAs issued; No G&G permits or ancillary activity notices issued	<u>Up to four</u> 2D/3D seismic or CSEM surveys in the Beaufort Sea (Beaufort) and <u>up to three</u> 2D/3D seismic or CSEM surveys in the Chukchi Sea (Chukchi) per year. <u>Up to one</u> of the total number of surveys in each sea can include ice breaking if necessary.	<u>Up to six</u> 2D/3D seismic or CSEM surveys in the Beaufort and <u>up to five</u> 2D/3D seismic or CSEM surveys in the Chukchi per year. <u>Up to one</u> of the total number of surveys in each sea can include ice breaking if necessary	Same as Alternative 3	Same as Alternative 3
		<u>Up to three</u> site clearance and high resolution shallow hazards survey programs in the Beaufort and <u>up to three</u> site clearance and high resolution shallow hazards survey programs in the Chukchi per year.	<u>Up to five</u> site clearance and high resolution shallow hazards survey programs in the Beaufort and <u>up to five</u> site clearance and high resolution shallow hazards survey programs in the Chukchi per year	Same as Alternative 3	Same as Alternative 3
		<u>One</u> on-ice seismic survey in the Beaufort per year.	Same as Alternative 2	Same as Alternative 2	Same as Alternative 2
		<u>One</u> exploratory drilling program in the Beaufort and <u>one</u> exploratory drilling program in the Chukchi per year.	<u>Up to two</u> exploratory drilling programs in the Beaufort and <u>up to two</u> exploratory drilling programs in the Chukchi per year.	Same as Alternative 3	Same as Alternative 3
Required Standard Mitigation Measures	None needed	Full range of those measures described in Section 2.4.9 of the EIS for consideration as needed.	Same as Alternative 2	Same as Alternative 2	Same as Alternative 2
Additional Mitigation Measures	None needed	Full range of those measures described in Section 2.4.10 of the EIS for consideration as needed.	Same as Alternative 2	Same as Alternative 2	Same as Alternative 2
				Additional required time/area closures for: <ul style="list-style-type: none"> • Camden Bay • Barrow Canyon/ Western Beaufort Sea • Shelf Break of the Beaufort Sea • Hannah Shoal • Kasegaluk Lagoon/ Ledyard Bay Critical Habitat Unit 	Additional Mitigation Measures that focus on the use of alternative technologies that have the potential to augment or replace traditional airgun-based seismic exploration activities.

2.1 Alternative 1 – No Action

NEPA's implementing regulations require that the No Action Alternative be evaluated. Under the No Action Alternative, NMFS would not issue any ITAs under the MMPA for seismic surveys or exploratory drilling in the Beaufort and Chukchi seas, and BOEM would not issue G&G permits or authorize ancillary activities in the Beaufort and Chukchi seas. If companies proceeded to operate in this area without MMPA authorizations, any takes of marine mammals would occur in violation of the MMPA.

2.2 Alternative 2 – Authorization for Level 1 Exploration Activity

Alternative 2 is defined as the following:

2.2.1 Level of Activity

- Up to **four** 2D/3D seismic or CSEM surveys in the Beaufort Sea and up to **three** 2D/3D seismic or CSEM surveys in the Chukchi Sea per year, with up to **one** of that total number of surveys in each sea including ice breaking if necessary.
- Up to **three** site clearance and high resolution shallow hazards survey programs in the Beaufort Sea and up to **three** site clearance and high resolution shallow hazards survey programs in the Chukchi Sea per year.
- **One** on-ice seismic survey in the Beaufort Sea per year.
- **One** exploratory drilling program in the Beaufort Sea and **one** exploratory drilling program in the Chukchi Sea per year.

2.2.2 Mitigation

- Including *required* Standard Mitigation Measures (described in Section 3.6) that are part of every action alternative.
- Including a full analysis of a wide range of Additional Mitigation Measures (described in Section 3.6) that *could potentially* be required through the MMPA process and could vary by alternative (i.e. some might be different based on level and/or type of activity in a given year)

2.2.3 Assumptions

Seismic work in the Arctic has traditionally been conducted in ice-free months (July through November); although this analysis addresses the possibility of one survey utilizing an icebreaker and potentially continuing through mid-December. Seismic surveys are also conducted on-ice in areas where there is bottom fast ice in the winter. These surveys generally occur from January through May. Each survey takes between 30 and 90 days, depending on ice conditions, weather, equipment operations, size of area to be surveyed, timing of subsistence hunts, etc. Because of the limited time period of open water, it is likely that concurrent surveys would be conducted in the same general time frame and may overlap in time, but will not overlap in space (i.e. within a minimum of approximately 24 km [15 mi] of each independent survey operation) for reasons regarding data integrity. It is assumed for analytical purposes that at least one of the authorized 2D/3D seismic surveys in the Beaufort Sea and one in the Chukchi Sea would utilize an ice breaker.

Exploratory activities (including deep penetration seismic, site clearance and high resolution shallow hazards, and exploratory drilling) in the next five years will be concentrated in areas of recently purchased leases. This does not mean that there will not be exploratory activities in other areas of the U.S. Arctic Ocean, especially if BOEM's next Five Year Lease Plan schedule includes sales in the Arctic

OCS. In the U.S. Beaufort Sea, the two primary areas of interest for exploration are nearshore in Camden Bay and Harrison Bay. In the U.S. Chukchi Sea, the areas of interest are all well offshore in the lease areas, particularly around drill sites from the late 1980s, including Shell's Burger, Crackerjack, and Shoebill sites; ConocoPhillips' Klondike site; and Statoil's leases in the northeast part of the Lease Sale 193 area.

2.3 Alternative 3 – Authorization for Level 2 Exploration Activity

Alternative 3 is defined as the following:

2.3.1 Level of Activity

- Up to **six** 2D/3D seismic or CSEM surveys in the Beaufort Sea and up to **five** 2D/3D seismic or CSEM surveys in the Chukchi Sea per year, with up to **one** of that total number of surveys in each sea including ice breaking if necessary.
- Up to **five** site clearance and high resolution shallow hazards survey programs in the Beaufort Sea and up to **five** site clearance and high resolution shallow hazards survey programs in the Chukchi Sea per year.
- **One** on-ice seismic survey in the Beaufort Sea per year.
- Up to **two** exploratory drilling programs in the Beaufort Sea and up to **two** exploratory drilling programs in the Chukchi Sea per year.

2.3.2 Mitigation

- Including *required* Standard Mitigation Measures (described in Section 3.6) that are part of every action alternative.
- Including a full analysis of a wide range of Additional Mitigation Measures (described in Section 3.6) that *could potentially* be required through the MMPA process and could vary by alternative (i.e. some might be different based on level and/or type of activity in a given year).

Assumptions for the analysis of Alternative 3 would be the same as those listed for Alternative 2.

2.4 Alternative 4 – Authorization for Level 2 Exploration Activity With Additional Required Time/Area Closures

Alternative 4 is defined as the following:

2.4.1 Level of Activity

- Same level of activity as Alternative 3.

2.4.2 Mitigation

- Including *required* Standard Mitigation Measures (described in Section 2.4.9) that are part of every action alternative.
- Including *required* time/area closures for specific areas important to biological productivity, life history functions for specific species of concern, and subsistence activities. Activities would not be permitted to occur in any of the areas listed here during the specific time/area closure periods identified. Additionally, buffer zones around these time/area closures could potentially be included. Buffer zones would require that activities emitting pulsed sounds would need to

operate far enough away from these closure areas so that sounds at 160 dB re 1 μ Pa rms do not propagate into the area or that activities emitting continuous sounds would need to operate far enough away from these closure areas so that sounds at 120 dB re 1 μ Pa rms do not propagate into the area. In the event that a buffer zone of this size was impracticable, a buffer zone avoiding the ensonification of the important habitat above 180 dB could be used.

- Camden Bay – An area of high biological productivity, including kelp communities; a feeding and resting area for bowhead whales (including subadults and females with calves); fall subsistence bowhead whale hunting area.
 - Bowhead whales: September 1 – October 15 for primary migration and feeding (Huntington and Quakenbush 2009, Koski and Miller 2009, Quakenbush et al. 2010a)
 - Subsistence (bowhead whale hunting): late August – early October (Huntington and Quakenbush 2009)
 - Except for emergencies or human/navigation safety, oil and gas exploration operations shall not occur within Camden Bay or the designated buffer zones during the dates noted here.
- Barrow Canyon and the Western Beaufort Sea – An area of high biological productivity; a feeding area for bowhead and beluga whales; fall subsistence bowhead whale hunting area.
 - Bowhead whales: late August – early October
 - Beluga whales: mid-July through late August
 - Except for emergencies or human/navigation safety, oil and gas exploration operations shall not occur within the Barrow Canyon area or the designated buffer zones from August 1 to the close of the fall bowhead whale hunt in Barrow.
- Shelf Break of the Beaufort Sea – A feeding area for beluga whales.
 - Beluga whales: mid-July through late-September
- Hanna Shoal – An area of high biological productivity (benthic organisms); a feeding area for various marine mammals (walrus, gray whales, and bearded seals).
 - Walrus: July – August (USGS 2011)
 - Gray whales: late August – early October
 - Except for emergencies or human/navigation safety, oil and gas exploration operations shall not occur within the Hanna Shoal area or the designated buffer zones from September 1 through October 15.
- Kasegaluk Lagoon/Ledyard Bay Critical Habitat Unit – An important habitat for beluga whales, spotted seals, and spectacled eiders; subsistence beluga whale hunting area.
 - Subsistence (Kasegaluk Lagoon beluga whale hunting): mid-June through mid-July
 - Except for emergencies or human/navigation safety, oil and gas exploration operations shall not occur within the Ledyard Bay Critical Habitat Unit or the designated buffer zones between July 1 and November 15.

- To the maximum extent practicable, aircraft supporting seismic operations shall avoid operating below 1,500 ft (457 m) over the Unit between July 1 and November 15.
- Including a full analysis of a wide range of Additional Mitigation Measures (described in Section 2.4.10) that *could potentially* be required through the MMPA process and could vary by alternative (i.e. some might be different based on level and/or type of activity in a given year). The time/area closures that are described in this section that are optional for Alternatives 2, 3, and 5 would not be optional but rather required under Alternative 4.

Assumptions for the analysis of Alternative 4 would be the same as those listed for Alternative 2.

2.5 Alternative 5 – Authorization for Level 2 Exploration Activity With Use of Alternative Technologies

Alternative 5 is defined as the following:

2.5.1 Level of Activity

- Same level of activity as Alternative 3.

2.5.2 Mitigation

- Including *required* Standard Mitigation Measures (described in Section 2.4.9) that are part of every action alternative.
- Including a full analysis of a wide range of Additional Mitigation Measures (described in Section 2.4.10) that *could potentially* be required through the MMPA process and could vary by alternative (i.e. some might be different based on level and/or type of activity in a given year), potentially including new mitigations developed to apply to new technologies.
- Including specific additional measures that focus on the use of alternative technologies that have the potential to augment or replace traditional airgun-based seismic exploration activities.

Assumptions for the analysis of Alternative 5 would be the same as those listed for Alternative 2.

2.6 Standard Mitigation Measures

2.6.1 Standard Required Mitigation Measures

The mitigation measures (and the identified mitigation monitoring needed to support them) listed below will be included as a requirement under every ITA issued for the type of activity identified. In addition, some or all of these measures may also be included in G&G permit or ancillary activity approvals by BOEM. Full descriptions of these measures are contained in Appendix A.

a) Detection-based measures intended to reduce near-source acoustic exposures and impacts on marine mammals within a given distance of the source

2D/3D seismic surveys, including In-ice Seismic; Site Clearance and High Resolution Shallow Hazards Surveys

- Establishment of 180 dB shutdown/power down radius for cetaceans and 190 dB shutdown/power down radius for pinnipeds.
- Specified ramp-up procedures for airgun arrays.

- Protected Species Observers (PSOs; formerly referred to as Marine Mammal Observers [MMOs]) required on all seismic source vessels and ice breakers, as well as on support (chase) vessels.

On-ice Seismic Surveys

- All activities must be conducted at least 150 m (490 ft) from any observed ringed seal lair.
- No energy source may be placed over a ringed seal lair.

Exploratory Drilling Activities

- PSOs required on all drill ships and ice management vessels.

b) Non-detection-based measures intended to more broadly lessen the severity of acoustic impacts on marine mammals or reduce overall numbers taken by acoustic source

This measure would be required for all activities that occur during the open-water season and In-ice (i.e. 2D/3D Seismic, including In-ice Surveys, Site Clearance and High Resolution Shallow Hazards Surveys, and Exploratory Drilling Activities).

- Specified flight altitudes for all support aircraft except for take-off, landing, and emergency situations.

c) Measures intended to reduce/lessen non-acoustic impacts on marine mammals

These measures would be required for all activities that occur during the open-water season and In-ice (i.e. 2D/3D Seismic, including In-ice surveys, CSEM surveys, Site Clearance and High Resolution Shallow Hazards Surveys, and Exploratory Drilling Activities).

- Specified procedures for changing vessel speed and/or direction to avoid collisions with marine mammals.
- Notification of lost equipment that could pose a danger to marine mammals.

On-ice Seismic Surveys

- When traveling on ice-roads, the area shall be monitored for marine mammals.

Exploratory Drilling Activities ONLY

- Operators are required to have a plan(s) in place that a) minimize the likelihood of a spill; b) outline the response protocol in the event of the spill; and c) identify the means of minimizing impacts to marine mammals following a spill.

d) Measures intended to ensure no unmitigable adverse impact to subsistence uses

These measures would be required for all activities that occur during the open-water season and In-ice (i.e. 2D/3D Seismic, including In-ice Surveys, CSEM surveys, Site Clearance and High Resolution Shallow Hazards Surveys, and Exploratory Drilling Activities).

- Shutdown of activities occurring in specific areas of the Beaufort Sea corresponding to the start and conclusion of the fall bowhead whale hunts in Nuiqsut (Cross Island) and Kaktovik beginning on or around August 25.
- Establishment and utilization of Communication Centers in subsistence communities to address potential interference with marine mammal hunts on a real-time basis throughout the season.

- Required flight altitudes and paths for all support aircraft in areas where subsistence occurs, except during take-off, landing, and emergency situations.

2.7 Additional Mitigation Measures

The mitigation measures (and mitigation monitoring needed to support them) listed below are evaluated in Chapter 4, which could lead to some of these measures becoming Standard Mitigation Measures in the Final EIS. In the future, these Additional Mitigation Measures will be evaluated in the context of each specifically described activity to determine whether they should be required by NMFS in a specific ITA or by BOEM in a specific G&G permit or ancillary activity notice approval to make the necessary findings under the MMPA or the OCS Lands Act. In short, these measures may, or may not, be incorporated in future permits and authorizations, depending on the specific activity and the analysis conducted pursuant to the MMPA and the OCS Lands Act.

a) Detection-based measures intended to reduce near-array acoustic exposures and impacts on marine mammals within a given distance of the source

2D/3D Seismic, and In-ice Surveys; Site Clearance and High Resolution Shallow Hazards Surveys; Exploratory Drilling Activities

- Sound source verification tests for sound sources and vessels at the start of the season.
- Measures to assess efficacy and improve detection capabilities in low visibility situations (e.g. Forward Looking Infrared [FLIR] imaging devices, 360° thermal imaging devices).
- Limiting activities in situations of low visibility.
- Measures to increase detection probability for real-time mitigation (e.g. to maintain 180 dB shutdown zones), such as passive and active acoustic monitoring.
- Enhancement of monitoring protocols and mitigation shutdown zones to minimize impacts in specific biologic situations (e.g. cow/calf groups and feeding or resting aggregations).

b) Non-detection-based measures intended to more broadly lessen the severity of acoustic impacts on marine mammals or reduce overall numbers taken by acoustic source

These measures would be required for all activities that occur during the open-water season and In-ice (i.e. 2D/3D seismic, including In-ice Surveys, Site Clearance and High Resolution Shallow Hazards Surveys, and Exploratory Drilling Activities).

- Temporal/spatial limitations to minimize impacts in particular important habitats, including Camden Bay, Barrow Canyon/Western Beaufort Sea, Hanna Shoal, the shelf break of the Beaufort Sea, and Kasegaluk Lagoon/Ledyard Bay Critical Habitat Unit.
- NMFS restricting number of surveys (of same level of detail) that can be conducted in the same area in a given amount of time (i.e. to avoid needless collection of identical data).

2D/3D Seismic, including In-ice Surveys ONLY

- Separate seismic surveys are prohibited from operating within 145 km (90 mi) of one another.

c) Measures intended to reduce/lessen non-acoustic impacts on marine mammals

These measures would be required for all activities that occur during the open-water season and In-ice (i.e. 2D/3D seismic, including In-ice seismic, CSEM surveys, Site Clearance and High Resolution Shallow Hazards Surveys, and Exploratory Drilling Activities).

- Vessel and aircraft avoidance of concentrations of groups of ice seals, walrus, and polar bears.

- Specified shipping or transit routes to avoid important habitat in areas where marine mammals may occur in high densities.

Exploratory Drilling Activities ONLY

- Requirements to ensure reduced, limited, or zero discharge of any or all of the specific discharge streams identified with potential impacts to marine mammals or marine mammal habitat.
- Operators are required to recycle drilling muds.

On-ice Seismic Surveys

- Use trained seal-lair sniffing dogs for areas with water deeper than 3 m (9.8 ft) depth contour to locate seal structures under snow in the work area and camp site before initiation of activities.
- Use trained seal-lair sniffing dogs to survey the ice road and establish a route where no seal structures are present.

d) Measures intended to ensure no unmitigable adverse impact to subsistence uses

These measures would be required for all activities that occur during the open-water season and In-ice (i.e. 2D/3D seismic, including In-ice surveys, CSEM surveys, Site Clearance and High Resolution Shallow Hazards Surveys, and Exploratory Drilling Activities).

- No transit of exploration vessels into the Chukchi Sea prior to July 15 or until the beluga hunt is completed at Point Lay.
- Vessels transiting east of Bullen Point to the Canadian border should remain at least 8 km (5 mi) offshore during transit along the coast, provided ice and sea conditions allow.
- Shutdown of exploration activities in the Beaufort Sea for the Nuiqsut (Cross Island) and Kaktovik bowhead whale hunts based on real-time reporting of whale presence and hunting activity rather than a fixed date.
- Shutdown of exploration activities in the Beaufort Sea for the Barrow bowhead whale hunts from Pitt Point on the east side of Smith Bay to a location about half way between Barrow and Peard Bay from September 15 to the close of the fall bowhead whale hunt in Barrow.
- Shutdown of exploration activities in the Chukchi Sea for the Barrow (the area circumscribed from the mouth of Tuapaktushak Creek due north to the coastal zone boundary, to Cape Halkett due east to the coastal zone boundary) and Wainwright (the area circumscribed from Point Franklin due south to the coastal zone boundary, to the Kuk River mouth due west to the coastal zone boundary) bowhead whale hunts based on real-time reporting of whale presence and hunting activity rather than a fixed date.
- Shutdown of exploration activities in the Chukchi Sea for the Point Hope and Point Lay bowhead whale hunts based on real-time reporting of whale presence and hunting activity rather than a fixed date.
- Transit restrictions into the Chukchi Sea modified to allow offshore travel under certain conditions (e.g. 32 km [20 mi] from the coast) if beluga whale, fall bowhead whale (Barrow and Wainwright), and other marine mammal hunts would not be affected.

Exploratory Drilling Activities ONLY

- For exploratory drilling operations in the Beaufort Sea west of Cross Island, no drilling equipment or related vessels used for at-sea oil and gas operations shall be moved onsite at any location outside the barrier islands west of Cross Island until the close of the bowhead whale hunt in Barrow.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Chapter 3 of the EIS describes the current condition of the physical, biological, and social environment in the EIS project area to serve as a baseline to compare the potential impacts of the alternatives. Chapter 4 of the EIS analyzes the potential impacts of each alternative on physical, biological, and social resources. Impact levels were determined in consideration of the following four criteria:

Intensity (Magnitude)

- Low: A change in a resource condition is perceptible, but it does not noticeably alter the resource's function in the ecosystem or cultural context.
- Medium: A change in a resource condition is measurable or observable, and an alteration to the resource's function in the ecosystem or cultural context is detectable.
- High: A change in a resource condition is measurable or observable, and an alteration to the resource's function in the ecosystem or cultural context is clearly and consistently observable.

Duration

- Temporary: Impacts would be intermittent, infrequent, or last no more than a single season.
- Long-term: Impacts would be frequent or extend up to several years.
- Permanent: Impacts would cause a permanent change in the resource that would perpetuate even if the actions that caused the impacts were to cease.

Extent

- Local: Impacts would be limited geographically; impacts would not extend to a broad region or a broad sector of the population.
- Regional: Impacts would extend beyond a local area, potentially affecting resources or populations throughout the EIS project area.
- State-wide: Impacts would potentially affect resources or populations beyond the region or EIS project area.

Context

- Common: The affected resource is considered usual or ordinary in the locality or region; it is not depleted in the locality and is not protected by legislation. The portion of the resource affected does not fill a distinctive ecosystem role within the locality or the region.
- Important: The affected resource is protected by legislation or is depleted either within the locality or the region. The portion of the resource affected fills a distinctive ecosystem role within the locality or the region.
- Unique: The affected resource is protected by legislation and the portion of the resource affected fills a distinctive ecosystem role within the locality or the region.

Separate impact criteria tables were developed and used to guide the analysis of impacts for each of the resources discussed under the physical, biological, and social environments. The impact criteria tables use terms and thresholds that are quantified for some components and qualitative for other components.

The terms used in the qualitative thresholds are relative, necessarily requiring the analyst to make a judgment about where a particular effect falls in the continuum from “negligible” to “major”.

Summary impact levels were then determined using the following guidance.

- Negligible: Impacts are generally extremely low in intensity (often they cannot be measured or observed), are temporary, localized, and do not affect unique resources.
- Minor: Impacts tend to be low in intensity, of short duration, and limited extent, although common resources may experience more intense, longer-term impacts.
- Moderate: Impacts can be of any intensity or duration, although common resources may be affected by higher intensity, longer-term, or broader extent impacts while unique resources may be affected by medium or low intensity, shorter-duration, local or regional impacts.
- Major: Impacts are generally medium or high intensity, long-term or permanent in duration, a regional or state-wide extent, and affect important or unique resources.

The following summary (Sections 3.1 to 3.3 of this Executive Summary) addresses only those resources that may experience greater than minor impacts, were identified during scoping as being of concern, or that highlight differences among the alternatives. Table ES-2 provides a summary of impacts to all resources for Alternative 1 through Alternative 5.

Because most of the alternative technologies associated with Alternative 5 have not yet been built and/or tested, it is difficult to fully analyze the level of impacts from them. The amount of traditional seismic surveys (i.e. use of airgun arrays) that can be replaced or augmented by these technologies is unknown; therefore, the level of impact reduction cannot be determined. This EIS examines a projected amount of use of these technologies but the actual amount that might be used between 2012 and 2017 is not fully known at this time. Therefore, NMFS has determined that additional NEPA analyses would likely be required if applications are received requesting to use these technologies.

Table ES-2 Comparison of Impacts

Impact Topic	Alternative 1- No Action Alternative	Alternative 2- Authorization for Level 1 Exploration Activity	Alternative 3- Authorization for Level 2 Exploration Activity	Alternative 4- Authorization for Level 2 Exploration Activity with Additional Required Time/Area Closures	Alternative 5- Authorization for Level 2 Exploration Activity with Use of Alternative Technologies	Very Large Oil Spill Scenario in Beaufort or Chukchi Sea
PHYSICAL ENVIRONMENT						
Physical Oceanography	No effect	Minor impacts from deposition of materials during exploratory drilling, construction of artificial island, ice-breaking, and on-ice seismic surveys.	Same types of impacts as Alternative 2, intensity and extent of the impact would be doubled, level of impact still minor.	Same as Alternative 3	Same as Alternative 3	Moderate impact from the viscosity and stickiness of oil floating at the sea surface, temporary duration.
Climate	No effect	Minor impacts due to low contribution to GHG emissions.	Although the projected direct GHG emissions are higher than those projected for Alternative 2, impacts would be minor due to their low magnitude.	Same as Alternative 3	Same as Alternative 3	Minor to moderate impact from activities associated with a VLOS that would cause a temporary increase in GHG emissions
Air Quality	No effect	Minor impacts due to emissions from fuel combustion for oil and gas exploration activities.	Moderate impacts because the increase in detrimental effects on air quality is expected to be minimal.	Same as Alternative 3	Same as Alternative 3	Minor impact, as associated activities could cause temporary increase in emissions.
Acoustics	No effect	Moderate impacts from sound of exploration activities.	Moderate, although the number of exploration programs is increased from Alternative 2, the same types of noise-generating sources are to be used.	Same as Alternative 3	Same as Alternative 3	Effects of spill response and cleanup on the acoustic environment would be considered minor to moderate.
Water Quality	No effect	Impacts reduced to negligible by mitigation measures.	Impacts reduced to negligible by mitigation measures.	Same as Alternative 3	Same as Alternative 3	Major impact from sustained degradation of water quality by hydrocarbon contamination exceeding state and federal water and sediment quality criteria.
Environmental Contaminants and Ecosystem Functions	No effect	Negligible impacts, they could be medium intensity but would be local and temporary.	Minor impacts due to the greater level of activity increasing the potential volume of contaminants introduced to the project area.	Same as Alternative 3	Same as Alternative 3	Major impact from contamination caused degradation of ecosystems functions.
BIOLOGICAL ENVIRONMENT						
Lower Trophic Levels	No effect	Minor impacts from disturbance of habitat and displacement of organisms from drilling, sediment sampling, ship anchoring, or platform installation; toxicity due to production discharge; increased productivity due to ice breaking. Introduction of invasive species from ship traffic could cause moderate impacts.	Minor impacts, the increased levels of activity would not generate different types or level of impacts. Introduction of invasive species from ship traffic could cause moderate impacts.	Same as Alternative 2, the time/area closures would not affect lower trophic levels.	Same as Alternative 2, the use of alternative technologies would not affect lower trophic levels.	Moderate to major impact depending on if the spill persists or affects unique resources.
Fish/Essential Fish Habitat	No effect	Negligible impacts, small scale and temporary only.	Negligible impacts, increased activities would not change the impact level.	Negligible impacts. The time/area closures would reduce the impacts to lower than Alternative 2.	Negligible impacts. The use of alternative technologies may reduce any impact.	Moderate impact from toxic exposure and habitat contamination.
Marine and Coastal Birds	No effect	Negligible impacts from temporary and localized disturbance, injury/mortality, and changes in habitat.	Negligible impacts, increased activities would not change the impact level.	Same as Alternative 3	Same as Alternative 3	Major impact from toxic exposure to prey and individuals, mortality of individuals, and contamination of habitat.

Impact Topic	Alternative 1- No Action Alternative	Alternative 2- Authorization for Level 1 Exploration Activity	Alternative 3- Authorization for Level 2 Exploration Activity	Alternative 4- Authorization for Level 2 Exploration Activity with Additional Required Time/Area Closures	Alternative 5- Authorization for Level 2 Exploration Activity with Use of Alternative Technologies	Very Large Oil Spill Scenario in Beaufort or Chukchi Sea
Marine Mammals: Bowhead Whales	No effect	Minor to moderate impacts from noise disturbance, possible ship strikes, or habitat degradation.	Moderate impacts from noise disturbance, possible ship strikes, or habitat degradation.	Moderate impacts. Although the Time/Area closures could reduce adverse impacts in particular times and locations, the impact level would not change.	Moderate impacts. Despite possible localized mitigating capabilities of alternative technologies the impact level would not change.	Major impact from toxic exposure, loss of seasonal habitat, reduction and contamination of prey, and disturbance from increased human activity.
Marine Mammals: Beluga Whales	No effect	Minor to moderate impacts from noise disturbance, possible ship strikes, or habitat degradation.	Moderate impacts from noise disturbance, possible ship strikes, or habitat degradation.	Moderate impacts. The effects on beluga whales would be similar to Alternative 3 but may occur in different times and places.	Moderate impacts. Although the gradual introduction of these alternative technologies could eventually reduce the amount of seismic noise introduced into the marine environment, alternative technologies would not completely replace the existing technology, so moderate impacts would remain.	Major impact from toxic exposure, loss of seasonal habitat, reduction and contamination of prey, and disturbance from increased human activity.
Marine Mammals: Other Cetaceans	No effect	Minor impacts from temporary, local disturbance.	Minor impacts from temporary, local disturbance. Increased activities would not change the impact level.	Minor impacts. Although the time/area closures could reduce adverse impacts in particular times and locations, the overall exploration effort may not be reduced, but, rather, redistributed and possibly concentrated in other areas, so the impact would not change.	Minor impacts. Alternative technologies could reduce the extent to localized areas on a small scale; it is not currently possible to assess potential behavioral reactions and determine if intensity level would change as a result.	Major impact from toxic exposure, loss of seasonal habitat, reduction and contamination of prey, and disturbance from increased human activity.
Marine Mammals: Pinnipeds	No effect	Minor impacts from temporary localized disturbance.	Minor impacts from temporary localized disturbance. Increased activities would not change the impact level.	Minor impacts. Although the time/area closures would reduce potentially adverse effects on seals in those areas, the impact level would not change.	Minor impact. Alternative technologies would presumably reduce the amount of noise introduced but would still use marine vessels which are at least as important for disturbance to seals in the water.	Minor to moderate impact from toxic exposure, loss of seasonal habitat, reduction and contamination of prey, and disturbance from increased human activity.
Marine Mammals: Pacific Walrus	No effect	Minor impacts from disturbance, risk of injury or mortality, and changes in habitat in the Chukchi Sea. No impact from activities in the Beaufort Sea as they are uncommon there.	Minor impacts from disturbance, risk of injury or mortality, and changes in habitat in the Chukchi Sea. Despite the increased activity, there would be no increase in the impact level. No impact from activities in the Beaufort Sea as they are uncommon there.	Minor impacts, although time/area closures would reduce potentially adverse effects on walrus in those areas. No impact from activities in the Beaufort Sea as they are uncommon there.	Minor impacts. Alternative seismic technologies for in-ice surveys would likely still require the use of ice and would therefore have similar disturbance effects on walrus as those technologies currently in use. No impact from activities in the Beaufort Sea as they are uncommon there.	Minor to moderate impact from VLOS in Chukchi sea from toxic exposure, loss of seasonal habitat, reduction and contamination of prey, and disturbance from increased human activity. Negligible effect from VLOS in the Beaufort as walrus are uncommon there.
Marine Mammals: Polar Bears	No effect	Minor impacts from temporary localized disturbance.	Minor impacts from temporary localized disturbance. Despite the increased activity, there would be no increase in the impact level.	Minor impacts. The time/area closures may protect ice seals, a primary food source for polar bears.	Minor impacts. Alternative technologies would presumably reduce the amount of noise introduced but would still use marine vessels which are at least as important for disturbance to polar bears in the water.	Moderate to major impacts from toxic exposure, habitat loss, contamination of prey, and increased human activity.
Terrestrial Mammals	No effect	Minor impacts from temporary localized disturbance, risk of vehicle strikes, and habitat alternations.	Minor impacts. Despite the increased activity, there would be no increase in the impact level.	Minor impacts. The time/area closures would not affect terrestrial mammals.	Minor impacts. The use of alternative technologies would not affect terrestrial mammals.	Minor to moderate impact from toxic exposure, habitat loss, and temporary disturbance.
SOCIAL ENVIRONMENT						
Socioeconomics	Minor adverse impact from unrealized local employment and tax revenue.	Minor beneficial impact from temporary rise in regional personal income and employment rates.	Minor beneficial impact. Despite the increased activity, there would be no increase in the impact level because the increases in income and employment rates are not more than 5 percent.	Minor beneficial impact. The time/area closures could reduce total local employment rates and personal income so the positive impact would be less than Alternative 2.	Minor beneficial impact. The alternative technologies could result in additional costs from lost productivity so the positive impact would be less than Alternative 2.	Major impact from changes in employment, revenues, workforce, demographics, subsistence, and local and state agency spending.
Subsistence	No effect	Negligible to moderate impacts from disturbance.	Negligible to moderate impacts from disturbance. Even with the increased activities, the impacts to subsistence resources and harvest would be similar in type, intensity, and duration, but would occur in more locations.	Negligible to moderate impacts from disturbance. However time/area closures would reduce impacts from disturbance on subsistence harvest and use for certain communities.	Negligible to moderate impacts from disturbance. The effectiveness of these alternative technologies to reduce adverse impacts to subsistence uses is unknown. If alternative technologies reduce disturbance to marine mammals, that would reduce impacts to subsistence users.	Major impact from contamination of the shoreline, tainting concerns, cleanup disturbance, and disruption of subsistence practices.

Impact Topic	Alternative 1- No Action Alternative	Alternative 2- Authorization for Level 1 Exploration Activity	Alternative 3- Authorization for Level 2 Exploration Activity	Alternative 4- Authorization for Level 2 Exploration Activity with Additional Required Time/Area Closures	Alternative 5- Authorization for Level 2 Exploration Activity with Use of Alternative Technologies	Very Large Oil Spill Scenario in Beaufort or Chukchi Sea
Public Health	No effect	Negligible impacts from changes to: <ul style="list-style-type: none"> Diet and nutrition Contamination Safety Acculturative stress Economic impacts Health care services 	Negligible impacts from changes to: <ul style="list-style-type: none"> Diet and nutrition Contamination Safety Acculturative stress Economic impacts Health care services Despite the increased activity, there would be no increase in the impact level.	Negligible impacts. If the time/area closures improve the likelihood of maintaining a strong subsistence harvest, there will also be resulting reduction in adverse impacts to public health. If the closures allow hunters to complete their hunts with less travel time, it will benefit safety. However, these benefits do not affect the overall impact criteria rating, as it is already negligible.	Negligible impacts. The alternative technologies may reduce disturbance to marine mammals, which could reduce adverse impacts to subsistence users. However, the effectiveness of the alternative technologies in reducing adverse impacts to subsistence uses is unknown. Therefore, the impact rating remains the same. If the alternative technologies are demonstrated to be effective, they would benefit public health.	Moderate to major impacts from introduced diseases from outside workers, strain on local health care system, poor air quality, increased stress, potentially contaminated food, and change to subsistence harvest patterns.
Cultural Resources	No effect	Negligible impact.	Negligible impact.	Minor impact. The time/area closures would not affect cultural resources.	Minor impact. The alternative technologies would not affect cultural resources.	Minor to moderate impact from onshore clean-up activities.
Land and Water Ownership, Use, and Management	Major adverse impacts from loss of opportunity to explore for oil and gas.	Moderate impacts to land and water use from activity in new areas and potential long-term development. Negligible impacts to land and water ownership and management as no changes in management or ownership would occur.	Moderate impacts to land and water use from possible conflict between subsistence use and seismic surveys, changes in industrial, transportation, and commercial land use and management. Slightly higher possibility of new facilities and infrastructure, higher levels of air and vessel traffic, and commercial activity associated with survey support. Minor impacts to land and water management - as activities increase, the possibility for conflicts with borough offshore development policies goes up as well. Negligible impacts to land and water ownership as no changes in ownership would occur.	Moderate impacts to land and water use. As time/area closures are implemented, the likelihood of conflicts decreases because the closures would lessen the exposure of subsistence species to seismic activities and exploratory drilling at critical locations and during critical seasons of the year. Time/area closures would shorten the timeframe available for oil and gas exploration activities and potentially impede exploration activity. As a result, there may be a reduction in transportation and commercial uses during certain times of the year. Minor impacts to land and water management. Constraining exploration to certain times and locations may result in more moderate state and federal resource development goals, while promoting management practices to protect the human, marine and coastal environments, and improve consistency with North Slope Borough and Northwest Arctic Borough comprehensive plans and Land Management Regulations. Therefore, because these techniques reflect balanced management and do not prohibit resource development, no inconsistencies or changes in federal or state land or water management are anticipated. Negligible impacts to land and water ownership as no changes in ownership would occur.	Moderate impacts to land and water use from activity in new areas and potential long-term development. Minor impacts to land and water management. Negligible impacts to land and water ownership as no changes in ownership would occur.	Major impact to land and water use and management from changes in resource use/values, and high response activity level, and changes in management to accommodate response. Negligible impact to land and water ownership.
Transportation	No effect	Negligible (aircraft and vessel) to minor (vessel) impacts from increased traffic.	Minor to moderate impacts from increased traffic.	Minor to moderate impacts from increased traffic. The time/area closures would limit the amount of aircraft overflights in these areas.	Minor to moderate impacts from increased traffic. It is assumed that these new alternative technologies would require the same levels of aircraft and surface and vessel support as under Alternative 3, and, therefore, the impacts are expected to be similar.	Moderate to major impacts from increased levels of air, vessel, and surface traffic from spill response activities.
Recreation and Tourism	No effect	Minor impacts from temporary and local effects on recreational setting.	Minor impacts from temporary and local effects on recreational setting. The increased levels of activity would not generate different types or level of impacts.	Minor impacts from temporary and local effects on recreational setting. If the time/area closures benefit marine mammals, they would also benefit recreation and tourism based on wildlife viewing.	Minor impacts from temporary and local effects on recreational setting. The alternative technologies would not affect recreation or tourism.	Major impact from displacement of recreationists and reduction in tourism
Visual Resources	No effect	Moderate impacts from high contrast of drill sites and associated activities.	Moderate impacts from high contrast of drill sites and associated activities.	Same as Alternative 3.	Same as Alternative 3.	Major impact from acute disturbance in visual resources.

Impact Topic	Alternative 1- No Action Alternative	Alternative 2- Authorization for Level 1 Exploration Activity	Alternative 3- Authorization for Level 2 Exploration Activity	Alternative 4- Authorization for Level 2 Exploration Activity with Additional Required Time/Area Closures	Alternative 5- Authorization for Level 2 Exploration Activity with Use of Alternative Technologies	Very Large Oil Spill Scenario in Beaufort or Chukchi Sea
Environmental Justice	No effect	Minor adverse impacts from disruption of subsistence activities and potential contamination of subsistence food. Minor beneficial impacts from local employment opportunities.	Minor adverse impacts from disruption of subsistence activities and contamination of subsistence food. Minor beneficial impacts from local employment opportunities.	Minor impacts. With the time/area closures, the impacts to subsistence activities could be further minimized but would remain minor.	Minor impacts. With the alternative technologies, the impacts to subsistence foods and human health could be further minimized but would remain minor.	Moderate to major impacts from disproportionate adverse effect on minority populations from impacts to subsistence foods and human health.

3.1 Physical Environment

3.1.1 Air Quality

The EIS project area is in attainment (or unclassifiable) for all air quality criteria pollutants. The maximum measured concentrations are all well below the National Ambient Air Quality Standards and Alaska State Standards. These values are indicative of the relatively good air quality in the area, and indicate that future development would not likely jeopardize the region's ability to meet the federal and State of Alaska air quality standards.

Impacts

- All action alternatives would cause minor to moderate impacts to air quality from air pollutant emissions. The majority of emissions are from fuel combustion for vessel propulsion and power generation. The expected emission levels would equal but not exceed air quality regulatory limits.
- The increase in emissions from the additional activities under Alternatives 3, 4, and 5 would be minimal so the impact remains moderate.

3.1.2 Acoustics

The existing airborne and underwater noise environment in the EIS project area is influenced by sounds from natural and anthropogenic sources. The primary natural source of airborne noise on the offshore, nearshore, and onshore regions is wind, although wildlife can produce considerable sound during specific seasons in certain nearshore and onshore regions. Anthropogenic noise levels in the Beaufort Sea region are higher than the Chukchi Sea due to the oil and gas developments of the nearshore and onshore regions of the North Slope, particularly in the vicinity of Prudhoe Bay. Noise sources consist of regular air traffic, vehicular traffic on the numerous roads within the development areas (such as around Deadhorse). Noise is also produced by the operations of heavy construction and industrial equipment that service the wells, processing facilities, pipelines, and camps. Industrial activities occur throughout the region on a year-round basis.

Anthropogenic noise levels in the nearshore and onshore region will be higher in populated areas – the coastal communities of Wainwright, Point Lay, Point Hope, Kivalina, and Barrow – with increasing noise levels associated with the larger communities. Community noise consists of aircraft, vehicular traffic (including all-terrain vehicles and snow machines), construction equipment, people talking/yelling, dogs barking, power plants, skiffs used for hunting, generators, etc.

Underwater noise is comprised of natural and anthropogenic sources. It varies temporally (daily, seasonally, annually) depending on weather conditions and the presence of anthropogenic and biological sources. Natural sound sources in the Arctic Ocean include earthquakes, wind, ice, and sounds from several animal species. Anthropogenic noise sources include vessel traffic, oil and gas exploration, and other miscellaneous sources.

Impacts

- While high sound levels do not constitute an effect, the presence of high sound levels from anthropogenic activity and consequent exposures of marine wildlife to these conditions could potentially cause effects. The impact criteria for acoustics are based on the existence of sound levels that could cause effects.
- All action alternatives would cause moderate impacts to acoustics because they produce underwater sound levels that could exceed ambient noise levels or exceed disturbance and injury thresholds.

- The increased activity under Alternatives 3, 4 and 5 would not raise the sound level above the moderate impact level.
- The time/area closures that characterize Alternative 4 are intended to avoid the ensonification above injury or disturbance thresholds of areas where marine mammals concentrate at higher densities to conduct specific important behaviors or in areas of typical subsistence hunts, which should result in a reduction in the total number of individuals taken, as well as avoiding the more potentially severe impacts that could be associated with disturbances to the identified biologically important behavior. Moderate impacts remain, as the exploration activities in non-closure areas/periods will introduce sources that produce underwater sound levels that exceed disturbance and injury thresholds.
- Under Alternative 5, the use of alternative technologies that reduce sound levels from seismic survey sources would not reduce the impact level which would be moderate. This is because it is unlikely the technologies will entirely preclude the generation of sound levels exceeding the injury and disturbance criteria.

3.2 Biological Environment

3.2.1 Marine Mammals

Bowhead and belugas whales are discussed below. The alternatives would be expected to have only minor impacts to other marine mammals (other cetaceans, pinnipeds, Pacific walrus, and polar bear) which are not discussed here. Please see Chapter 4 of the EIS for a complete discussion of impacts to these species.

Both bowhead and beluga whales could be present in the EIS project area throughout the spring, summer, and fall. Both species use the area during migration and for feeding. Bowhead whales are known to concentrate in the Barrow area for feeding during the spring and fall, in Camden Bay in the fall, and on the western Beaufort Sea shelf off Point Barrow in the late summer and fall. Beluga whales are known to feed in Barrow Canyon, the Shelf Break of the Beaufort Sea, and in Kasegaluk Lagoon/Ledyard Bay Critical Habitat.

The primary impact on bowhead and beluga whales resulting from the action alternatives would be from noise exposure. Noise can cause behavioral disturbance and, in specific limited circumstances, auditory impairment. Disturbance to feeding, resting, or migrating bowhead or beluga whales could cause whales to leave areas of exploration activity during the activity and potentially avoid them in the future as well, effectively reducing their available habitat. Ship strikes and habitat degradation are also possible. Oil and gas exploration activities that may alter whale habitat include: disturbance of sea ice from icebreaking, disturbance of benthic sediments during drilling, contamination of the marine environment from discharge of drilling muds and other waste streams from ships and support facilities.

Impacts

- All action alternatives would cause minor to moderate impacts to bowhead and beluga whales from noise disturbance, risk of ship strikes, and habitat degradation.
- The increased activity under Alternatives 3, 4 and 5 would not increase the impact level above moderate for bowhead and beluga whales.
- The time/area closures under Alternative 4 would reduce the potential disturbance to bowhead and beluga whales in the closure areas during time periods specified. Exploration activities could, however, occur during different time periods within these areas, leading to a short-term reduction of effects. In addition, industry may relocate exploration activities to other, possibly adjacent, areas until the closure areas are available. Exploration effort may not be reduced, but,

rather, redistributed and possibly concentrated in other areas. The time/area closures that mitigate adverse impacts on concentrations of bowhead whales, mothers and calves, and important life history functions, such as feeding, could reduce impacts to a lower intensity, shorter duration and more localized areas than would result if the closures were not implemented. However, bowhead whale habitat use in the EIS project area is dynamic and, when migration corridors are considered includes large portions of the Beaufort and Chukchi seas that are not included in the time/area closures. Although the time/area closures could mitigate adverse impacts in particular important times and locations (lessening the intensity of the impacts), the total impact on (in terms of number of takes of) bowhead whales and beluga whales from oil and gas exploration activities allowed under Alternative 4 would be similar to Alternative 3 and would be considered moderate.

- The use of alternative technologies under Alternative 5 may reduce adverse impacts associated with the use of airgun arrays, but the results are difficult to determine and the overall reduction would likely be minimal. Airgun noise would not be eliminated, however, since these alternative technologies would not completely replace the existing technology, and what may be replaced is limited. In addition, surveys conducted with alternative technologies would still use marine vessels to tow or deploy equipment which could disturb bowhead whales, beluga whales, and other cetaceans. While the use of the alternative technologies described here in lieu of, or as a mitigation for, seismic airguns would be expected to reduce the extent of impacts somewhat; due to the fact that some of the technologies are still in the development phase, which means that neither their effects nor potential date of availability are well known, it is not currently possible to predict to what degree impacts on marine mammals will be reduced.

3.3 Social Environment

3.3.1 Socioeconomics

Exploration, development, production, and transportation of oil and gas are the major contributors to the economy of Alaska and the NSB. Other sectors include government, transportation, and mining.

Impacts

- Alternative 1 (No Action) would cause minor adverse impacts from unrealized local employment and tax revenue. The potential unrealized revenue for state and federal governments is unknown since the likelihood of exploration resulting in production cannot be predicted.
- All four action alternatives would cause minor beneficial impacts from a temporary rise in regional personal income and employment rates.
- Alternatives 3, 4, and 5 would not cause an increase in the level of beneficial impact because income and employment rates are not expected to rise more than five percent.
- The time/area closures under Alternative 4 could reduce total income and employment rates and therefore the beneficial impact would be less than Alternative 3, but would still be minor.
- The alternative technologies requirement under Alternative 5 could cause additional costs from lost productivity so the beneficial impact would be less than Alternative 3, but would still be minor.

3.3.2 Subsistence

Subsistence resources in the EIS project area are harvested by the communities of Kaktovik, Nuiqsut, Barrow, Wainwright, Point Lay, Point Hope, Kivalina, and Kotzebue. Resources harvested include the bowhead whale, beluga whale, seals (bearded, ribbon, ringed, and spotted), walrus, polar bear, fish, migratory waterfowl (including their eggs), and caribou.

Oil and gas exploration activities could disturb and displace subsistence resources, causing them to move away from coastal waters and become less readily available to subsistence hunters. Contamination of subsistence resources through discharge of drilling muds and other waste streams from ships and support facilities industrial pollution would be possible.

Impacts

- All action alternatives except Alternative 4 (time/area closures) would have impacts ranging from negligible to moderate depending on the species to be harvested. Minor to moderate impacts are expected for bowhead and beluga whales, negligible to minor impacts for seals, walrus, polar bears, fish, birds, and caribou.
- Alternative 4 would see a slight reduction in adverse impacts on subsistence uses from Alternative 3 because the time/area closures that protect whales would be required for all activities rather than being considered as an additional mitigation measure. Minor impacts are expected for bowhead and beluga whales, negligible to minor impacts for seals, walrus, polar bears, fish, birds, and caribou.
- The impact level under Alternative 5 would be reduced if the alternative technologies are successful in reducing disturbance to marine mammals.

3.3.3 Land and Water Ownership, Use, and Management

The lands and waters within the EIS project area are owned and managed by many different entities including: the federal government, state government, borough government, Alaska Native corporations, and Alaska Native allottees. Land and water uses in the area include; recreation, subsistence, industrial, residential, mining, protected natural areas, transportation, and commercial activities.

Oil and gas exploration activities could affect land and water ownership, use, or management by causing a change in the ownership, use, or management of land or water in the EIS project area. These changes could include; rezoning, increases in transportation activity, construction of infrastructure, and seismic surveys in subsistence hunting areas.

Impacts

- The No Action alternative would have a major impact on land and water use and management because it would be a significant change from existing conditions. This alternative would be contrary to current federal and state management of offshore waters. This alternative would cause a change in activity levels and affect management plans and would change federal, state, and private development rights by preventing exploration for oil and gas resources.
- Impacts to land and water use would be moderate for all four action alternatives due to changes in use patterns.
- Impacts to land and water management would be as follows for the four action alternatives: negligible for Alternative 2 as no changes are expected; minor for Alternative 3 as the increased activity level may cause conflicts with management plans; minor for Alternative 4 because the time/area restrictions are a change in management; and minor for Alternative 5.
- Impacts to land and water ownership would be negligible for Alternatives 2, 3, 4 and 5 as no changes in ownership would occur.

3.3.4 Visual Resources

Visual resources within the EIS project area are dominated by characteristics of the Beaufort and Chukchi seas. The visual characters of these waterbodies undergo dramatic changes across seasons, due in large part to the dynamic seasonal cycle of sea ice. During the fall, winter, and spring seasons, both the Beaufort and Chukchi seas are covered by sea ice. The scenic quality of the EIS project area (separated into the east/west portions of the Beaufort and Chukchi seas) was ranked using the following seven key factors: landform, vegetation, water, color, adjacent scenery, scarcity, and cultural modification. All four sections were ranked as having Class A scenery during summer months and Class B scenery during the winter months.

Oil and gas exploration activities would affect impact visual resources by creating visual contrast that may change the scenic quality of the area.

Impacts

- All four action alternatives would have short-term, moderate impacts on scenic quality and visual resources.
- Alternatives 3, 4, and 5 could have higher intensity impacts because of the greater number of support vessels used in the two exploratory drilling programs if both programs are implemented close to each other. However, impacts would not increase above the moderate level.
- Neither the implementation of time/area closures nor the use of alternative technologies would affect visual resources.

3.4 Comparison of Impacts by Alternative

Alternative 1 would have adverse direct or indirect impacts on two resources: socioeconomics and land and water ownership, use, and management. If NMFS did not issue any ITAs and BOEM did not issue G&G permits or ancillary activity notices as discussed under Alternative 1, it would effectively prevent offshore exploration for oil and gas resources causing a loss of local employment and tax revenue, and a major change in land use.

None of the four action alternatives would have major impacts on any resource. The biggest difference among the four action alternatives is between Alternatives 2 and 3, due to the difference in the level of activity. To illustrate this, it is useful to compare the number of resources that would experience a summary level of moderate impacts: Alternative 2 would moderately impact four resources, while Alternatives 3 and 5 would impact seven, and Alternative 4 would impact six. Alternative 2 also has the highest number of resources that would have negligible impacts at nine, compared to five resources under the other alternatives.

The time/area closures under Alternative 4 would reduce the summary level of impact for subsistence resources. Although it would also reduce impacts to bowhead and beluga whales and other marine mammals, the amount of benefit gained would not reduce the summary impact levels from moderate to minor.

The impacts of Alternatives 3 and 5 would be the same because the effectiveness of the alternative technologies to reduce impacts is currently unknown, and it is expected that some level of existing technology would still be used during the timeframe of this EIS.

NMFS analyzed the impact of each alternative on 25 different resource categories. Table ES-3 shows the number of resources impacted at each level by alternative.

Table ES-3 Impact Conclusions by Alternative

Impact Conclusion	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Negligible	0	9 Resources	5 Resources	5 Resources	5 Resources
Minor	1 Resource	10 Resources	12 Resources	13 Resources	12 Resources
Minor to Moderate	0	2 Resources	1 Resource	1 Resource	1 Resource
Moderate	0	4 Resources	7 Resources	6 Resources	7 Resources
Major	1 Resource	0	0	0	0

The following sections summarize the impacts of each action alternative.

3.4.1 Alternative 2 Impact Levels

Alternative 2 would have moderate impacts on four resources: acoustics; land and water ownership, use, and management; subsistence, and visual resources. Minor to moderate impacts would occur to bowhead whales and beluga whales. Minor impacts would occur to: physical oceanography; climate; air quality; lower trophic levels; other cetaceans; pinnipeds; polar bears; terrestrial mammals; and socioeconomics. Impacts to all other resources would be negligible. A summary of this information can be seen in Table ES-4.

Table ES-4 Alternative 2 Impact Levels

Minor	Minor to Moderate	Moderate
Physical Oceanography Climate Air Quality Lower Trophic Levels Other Cetaceans Pinnipeds Pacific Walrus (Chukchi) Polar Bears Terrestrial Mammals Socioeconomics	Bowhead Whales Beluga Whales	Acoustics Visual Land and Water Ownership, Use, and Management Subsistence

3.4.2 Alternative 3 Impact Levels

Alternative 3 would have moderate impacts to seven resources: air quality; acoustics; bowhead whales; beluga whales; land and water ownership, use, and management; subsistence; and visual resources. Minor to moderate impacts would occur to transportation. Minor impacts would occur to physical oceanography, climate, environmental contaminants and ecosystem functions, lower trophic levels, other cetaceans, pinnipeds, Pacific walrus, polar bears, terrestrial mammals, socioeconomics, recreation and tourism, and environmental justice. Impacts to all other resources would be negligible. A summary of this information can be seen in Table ES-5.

Table ES-5 Alternative 3 Impact Levels

Minor	Minor to Moderate	Moderate
Physical Oceanography Climate Environmental Contamination Lower Trophic Levels Other Cetaceans Pinnipeds Polar Bears Terrestrial Mammals Environmental Justice Pacific Walrus Socioeconomics (beneficial) Recreation and Tourism	Transportation	Acoustics Visual Land and Water Ownership, Use, and Management Subsistence Air Quality Beluga Whales Bowhead Whales

3.4.3 Alternative 4 Impact Levels

Alternative 4 would have moderate impacts on five resources: air quality; acoustics; beluga whales, land and water ownership, use, and management; and visual resources. Subsistence resources would benefit from the time/area closures, so the impact level would be minor and beneficial. Minor to moderate impacts would occur to transportation. Minor impacts would occur to physical oceanography, climate, environmental contaminants and ecosystem functions, lower trophic levels, other cetaceans, pinnipeds, Pacific walrus, polar bears, terrestrial mammals, socioeconomics, recreation and tourism, and environmental justice. Impacts to all other resources would be negligible. A summary of this information can be seen in Table ES-6.

Table ES-6 Alternative 4 Impact Levels

Minor	Minor to Moderate	Moderate
Physical Oceanography Climate Environmental Contamination Lower Trophic Levels Other Cetaceans Pinnipeds Polar Bears Terrestrial Mammals Environmental Justice Pacific Walrus Socioeconomics Subsistence Recreation and Tourism	Transportation	Acoustics Visual Land and Water Ownership, Use, and Management Air Quality Beluga Whales

3.4.4 Alternative 5 Impact Levels

Alternative 5 would have the same level of impacts as Alternative 3. The use of alternative technologies would not change the level of impact for any of the resources.

3.5 Cumulative Impacts

Cumulative effects of development are a major concern of many stakeholders in the Chukchi and Beaufort seas. The nature and level of activities in the Arctic have been increasing over time, particularly in offshore areas. Changes in climate characteristics are also factors in potential cumulative effects. Past, present, and reasonably foreseeable future actions and activities considered for the cumulative effects analysis include: oil and gas exploration, development, and production activities; scientific research; mining exploration, development, and production; military facilities and training exercises; air and marine transportation; major community development projects; subsistence activities; recreation and tourism; and climate change. Commercial whaling in the late 19th century is also a past effect specific to bowhead whales that still influences population levels.

Alternative 1 would have minor cumulative impacts to socioeconomics, and major cumulative impacts to land and water ownership, use and management.

Any of the four action alternatives would have major cumulative impacts on visual resources and moderate impacts on climate, air quality, lower trophic levels, bowhead whales, beluga whales, subsistence, and visual resources.

4.0 OIL SPILL ANALYSIS

While not considered part of any of the proposed alternatives, NMFS analyzed the potential environmental effects of a low-probability, high impact event, a hypothetical very large oil spill (VLOS) in the Chukchi and Beaufort seas. For the Chukchi Sea, the discussion relies heavily on the recent BOEM Lease Sale 193 Revised Draft Supplemental EIS (BOEM 2011b) and other publicly available information. For the Beaufort Sea, the discussion and analysis is incorporated from the recent BOEM 2012-2017 OCS Oil and Gas Leasing Program Draft Programmatic EIS (BOEM 2011d).

In summary, a VLOS in either the Chukchi or Beaufort seas would have:

- Major adverse impacts to water quality; environmental contaminants and ecosystem functions; marine and coastal birds; bowhead whales; beluga whales; other cetaceans; socioeconomics; subsistence; land and water ownership, use, and management; recreation and tourism; and visual resources.
- Moderate to major adverse impacts to acoustics, lower trophic levels, polar bears, public health, transportation, and environmental justice.
- Moderate adverse impacts to physical oceanography and fish/essential fish habitat.
- Minor to moderate adverse impacts to climate, seals, walrus, terrestrial mammals, and cultural resources.
- Minor adverse impacts to air quality.

5.0 IMPLEMENTATION, MONITORING AND REPORTING, AND ADAPTIVE MANAGEMENT

5.1 EIS Implementation and NEPA Compliance

The Final EIS will identify the Preferred Alternative. The Record of Decision (ROD) will provide a listing of activities addressed by the Preferred Alternative and will identify any conditions of approval that are relevant to industry authorization requests. The EIS and ROD together constitute a decision document to be used for ongoing and future permitting activities addressed by this EIS. NMFS and BOEM will use the EIS when issuing ITAs and G&G permits and ancillary activity notices for oil and gas exploration that may occur within the five-year period of 2012 through 2017. Because the EIS addresses general effects and is not specific to the request for an ITA for a particular activity, additional NEPA review may be required for each application for authorization. The form of the additional review will depend on the nature and scope of the proposed activity. The review may take the form of:

- Categorical Exclusion and/or a Memorandum to the File;
- An Environmental Assessment (EA);
- A Supplemental EIS; or
- A new EIS.

BOEM intends to conduct site-specific NEPA analyses that either tier from the EIS or incorporate it by reference. BOEM would also use the EIS to assist in carrying out other statutory responsibilities such as working with NMFS and the U.S. Fish and Wildlife Service to ensure compliance with the Endangered Species Act and Magnuson-Stevens Fishery Conservation and Management Act, and where needed could modify permit conditions or lease operation to meet the requirements of any Endangered Species Act or MMPA authorization.

5.2 Monitoring and Reporting

The MMPA mandates that an authorization issued for the incidental take of marine mammals include a requirement that the taking be monitored and reported. The purposes, goals, and objectives of monitoring and reporting under the MMPA are summarized below.

Monitoring measures should be designed to accomplish or contribute to one or more of the following goals:

To increase the understanding of –

- The likely occurrence of marine mammal species in the vicinity of the action, i.e., presence, abundance, distribution, and/or density of species.
- The nature, scope, or context of the likely exposure of marine mammal species to any of the potential stressor(s) associated with the action (e.g. sound or visual stimuli), through a better understanding of one or more of the following: 1) the action itself and its environment (e.g. sound source characterization, propagation, and ambient noise levels); 2) the affected species (e.g. life history or dive patterns); 3) the likely co-occurrence of marine mammal species with the action (in whole or part) associated with specific adverse effects, and/or; 4) the likely biological or behavioral context of exposure to the stressor for the marine mammal (e.g. age class of exposed animals or known pupping, calving or feeding areas).
- How individual marine mammals respond (behaviorally or physiologically) to the specific stressors associated with the action (in specific contexts, where possible, e.g., at what distance or received level).

- How anticipated individual responses, to individual stressors or anticipated combinations of stressors, may impact either: 1) the long-term fitness and survival of an individual; or 2) the population, species, or stock (e.g. through effects on annual rates of recruitment or survival).
- The effectiveness of mitigation and monitoring measures.
- The manner in which the authorized entity complies with the incidental take authorization and incidental take statement.
- An increase in the probability of detecting marine mammals (through improved technology or methodology), both specifically within the safety zone (thus allowing for more effective implementation of the mitigation) and in general, to better achieve the above goals.

Applicants should target questions that have been identified as priorities (i.e. to fill data gaps). Proposed monitoring plans are evaluated using the above guidance, considering the likelihood of effectively answering the questions. Regulations prescribe that monitoring plans undergo an independent peer review.

5.2.1 Monitoring Plan Peer Review

The MMPA requires that monitoring plans be independently peer reviewed “where the proposed activity may affect the availability of a species or stock for taking for subsistence uses.” NMFS’s regulations written to implement this requirement state, “Upon receipt of a complete monitoring plan, and at its discretion, [NMFS] will either submit the plan to members of a peer review panel for review or within 60 days of receipt of the proposed monitoring plan, schedule a workshop to review the plan.” Although the MMPA only includes this requirement for IHAs, in its implementing regulations, NMFS extended this requirement to include LOAs as well.

In the 1980s and 1990s, NMFS convened a meeting each year between the applicable Federal agencies, ITA applicants for the upcoming open-water season, industry and agency scientists, and Native Alaskan subsistence hunters to discuss best ways to monitor the effects of the upcoming programs on marine mammals. These meetings would typically last a few days where there would be a robust discussion between all parties involved. ITA applicants would then adjust their monitoring programs based on the discussions. At that time, these meetings served to meet the requirement for an independent peer review via the workshop option described in the regulations.

In the late 1990s and early 2000s, these meetings were not held because there was very little activity during the open-water season in the U.S. Arctic Ocean. NMFS began to reconvene the meetings in 2006 when the level of activities for the open-water season began to increase. These annual meetings came to be known as the Arctic Open-Water Meeting. However, while these meetings were initially small gatherings of 15 to 30 people in the 1980s and early 1990s, from 2006 through 2011 the meetings drew approximately 150 to 250 participants each day, thus making it difficult to include the focused and detailed reviews of the applicants’ monitoring plans.

In order to ensure the focused independent peer review of the monitoring plans prescribed by the regulations, in 2010, NMFS divided the annual meeting into two separate parts, one larger and more open to stakeholder input, and one smaller meeting where a group of scientists specifically gathers to review the monitoring reports. In 2010 and 2011, after soliciting nominations from the industry ITA applicants, the Marine Mammal Commission, and the affected subsistence communities and representative organizations, NMFS convened panels of approximately five to seven scientists to provide an independent scientific review of the plans. During these reviews, NMFS charged the peer review panel members with determining whether or not the monitoring plans put forth by the applicants are appropriate. After the meeting, the panel members provided a final report to NMFS with their recommendations. NMFS reviews the peer review panel report in the context of the applicants’ activities and the requirements of the MMPA and selects those that were appropriate for potential inclusion in the applicant’s final monitoring

plans. NMFS then works with the applicants regarding the practicability of including these measures and protocols, and then includes the selected measures as requirements in the issued IHAs.

This process is still developing, and some strengths and weaknesses have been identified. Utilizing a smaller group chosen from nominated scientists allows for a true scientific, and more independent, review of the monitoring plans. The peer review panel report (which was not provided prior to 2010) provides NMFS with concrete recommendations that can be put forth to the applicants to improve the plans. Panel members have suggested that the time allotted for interaction with the applicants in 2010 and 2011 was too short, and as a result NMFS plans to allow for longer interactions. Also, at the request of the applicants, questions will be provided to them in advance so that they can come prepared to discuss specific issues identified by the panel members. Generally, both scientist reviewers and applicants have expressed that this more focused method for peer review of the monitoring reports is more effective than past methods. However, it is an iterative process, and NMFS intends to continue modifying the methods as necessary to most effectively solicit input and ensure implementation of the best monitoring plans.

5.2.2 Potential Improvements for Monitoring and Reporting Plans

Recommendations from improvements to monitoring plans have been made to NMFS at the Arctic Open-Water Meetings, through public comments on NEPA and MMPA documents, and at Plan of Cooperation (POC) meetings. The new peer review format that has been development includes:

- focused prioritization of needs, and
- guidance to applicants before they develop their initial applications.

In the last two years, the independent peer reviewers have included in their report, recommendations (related to both the goals of monitoring, in addition to methodology) that could be more broadly applied to multiple applicants. This type of comprehensive consideration of multiple monitoring activities across multiple years is what was identified as a mechanism to accomplish combined monitoring in the U.S. Arctic.

NMFS is considering several methods to more comprehensively prioritize and plan ITA monitoring:

- Developing and maintaining (on the NMFS website) a list of monitoring priorities and data gaps for Arctic oil and gas development projects;
- Soliciting input for this list from Open-Water Meetings, peer review panels, public comment periods, or, potentially, a longer term panel convened specifically to develop these priorities;
- Including specific recommendations for discrete monitoring projects (with suggested methodologies) that could be adopted by new applicants; and
- Considering and describing how to best build on existing monitoring results and best integrate data collection, analysis, and reporting with simultaneous monitoring efforts.

NMFS intends to explore the possibility of using the existing public input tools to develop an iterative and systematic annual means of identifying and prioritizing the monitoring goals for Arctic oil and gas exploration activities. These priorities could be available to potential applicants on the NMFS website along with specific methodology recommendations summarized from previous peer review recommendations to provide direction and guidance to applicants and allow for the most effective use of resources to answer the most pressing questions related to the effects of oil and gas exploration on marine mammals. NMFS would evaluate this method of providing guidance through public input received on this EIS and at the 2012 Open-Water Meeting and beyond.

5.2.3 BOEM's Environmental Studies Program

The OCS Lands Act authorizes an Environmental Studies Program (ESP) to establish the information needed for assessment and management of environmental impacts on the human, marine, and coastal environments of the OCS. The Alaska Studies Plan complements and reinforces the goals of the ESP. The ESP is guided by several broad themes:

- Monitoring Marine Environments;
- Conducting Oil-Spill Fate and Effects Research;
- Minimizing Seismic and Acoustic Impacts;
- Understanding Social and Economic Impacts; and
- Maintaining Efficient and Effective Information Management;

The Alaska OCS Region continually proposes new studies and pursues information needs in conjunction with ESP goals in order to answer the following fundamental questions:

- What is the expected change in the human, marine, and coastal environment due to offshore activity?
- Can undesirable change be minimized by mitigation measures?

Currently, the Alaska ESP is primarily focused on upcoming developments, exploration activities, and existing and potential future lease sales in the Beaufort Sea and Chukchi Sea Planning Areas. The Alaska ESP maintains a long list of ongoing and proposed studies in both seas.

5.3 Tools for Mitigating Impacts on Subsistence

Several processes and programs have evolved to facilitate interaction between the industry and the affected local communities to ensure that the Arctic subsistence culture can continue to thrive in conjunction with oil and gas exploration and development. Some of these processes are Federally-mandated while others have been voluntary between the industry and local communities. This section discusses three of these tools:

- (1) Plans of Cooperation (POC), which are required by NMFS' implementing regulations;
- (2) Open Water Season Conflict Avoidance Agreements (CAA), which are voluntary and not required by any statute or regulation; and
- (3) The annual Arctic Open-Water Meeting.

For the purposes of protecting the subsistence uses of marine mammals, the MMPA implementing regulations require that for an activity that will take place near a traditional Arctic hunting ground, or may affect the availability of marine mammals for subsistence uses – an applicant for MMPA authorization must either submit a POC or information that identifies the measures that have been taken to minimize adverse impacts on subsistence uses. The regulations provide further guidance by describing that a POC must include the following:

- a statement that the applicant has notified the affected subsistence community and provided them a draft POC;
- a schedule for meeting with the communities to discuss proposed activities and resolve potential conflicts regarding any aspects of the operation or POC;
- a description of measures the applicant has taken or would take to ensure that proposed activities would not interfere with subsistence hunting; and
- what plans the applicant has to continue to meet with the communities, prior to and during the activity, to resolve conflicts and notify the community of any changes in the activity.

5.3.1 Conflict Avoidance Agreement and Plan of Cooperation

In 1985, the AEWG and a number of arctic offshore oil and gas operators began working together to identify and mitigate sources of industrial interference with bowhead whale subsistence hunting. Recognizing the need to facilitate the co-existence of marine mammal subsistence uses and arctic offshore industrial activities, in 1986, Congress amended the MMPA to require that the issuance of ITAs rest on a Secretarial finding of “no unmitigable adverse impact to the availability” of marine mammal subsistence resources. The AEWG and offshore operators undertook an annual initiative to develop mitigation measures, which came to be known as the Open Water Season Conflict Avoidance Agreement (CAA) Process, with each year’s CAA Process resulting in an agreement, the CAA, signed by the participants. Input from the impacted bowhead whale subsistence communities indicates that they have historically found that the CAA process, through its highly interactive aspects, has effectively resulted in the development and implementation of measures that will ensure no unmitigable adverse impact. Based on this, for many years, NMFS generally assumed, with some associated analysis, that if a company and the AEWG signed a CAA (which typically contained the components of a POC), then it was possible for a company to conduct their activity without having an unmitigable adverse impact on the subsistence hunt. However, in more recent years, some companies have become reluctant to sign a CAA with the AEWG, suggesting that the agreement requires more from the industry than is necessary to ensure no unmitigable adverse impact to the hunt. Additionally, some stakeholders have raised the issue that a CAA developed by the AEWG does not represent the interests of subsistence hunts of species other than bowhead whales. Last, NMFS and BOEM have no authority to require agreements between third parties, and neither NMFS nor BOEM would be able to enforce the provisions of CAAs because the federal government is not a party to the agreements. These concerns highlight NMFS’ responsibility to conduct a rigorous and comprehensive independent analysis of the likely subsistence impacts and to specifically review the contents of each company’s POC. However, the AEWG has raised concerns about the POCs, asserting that while the CAA process traditionally provided content for the regulatory POC process, the POC process as currently implemented by some companies takes place in a one-way fashion, i.e., the company develops a POC without meaningful input from the subsistence communities.

To date, individual companies conducting activities in a given year, as well as the impacted subsistence communities, are involved in meetings related to both the negotiation of CAAs (regardless of whether they are ultimately signed by either party) and the development of POCs. Participating in both of these processes necessitates a lot of work on the part of all parties. With input from both subsistence communities and the applicants for MMPA authorization, NMFS plans to explore methods of clarifying the requirements of the MMPA (as they relate to the POC and ensuring no unmitigable adverse impact) that would incorporate the effective pieces of the CAA negotiations, while continuing to ensure compliance with the MMPA as it relates to the subsistence hunt of all affected species.

5.3.2 Arctic Open-Water Meeting

The Arctic Open-Water Meeting is the stakeholder meeting that is conducted to ensure NMFS’ understanding of the effects of industry activity on the subsistence uses of marine mammals, with input from the subsistence users. The Arctic Open-Water Meeting has typically attracted members of industry, Federal, state, and local government officials and scientists, Native Alaskan marine mammal commissions, affected Native Alaskan hunters and community members, environmental non-governmental organizations, and other interested members of the public. Typically, the industry presents the results of their marine mammal monitoring programs from the previous year and activities proposed for the upcoming season along with the associated monitoring plans. Alaska Native subsistence group representatives (e.g. whaling captains and AEWG members) present information related to impacts that industry activities may have had (either in the past year or historically) on their ability to effectively hunt a given species. There have also been presentations of ongoing western and traditional science programs conducted in the region.

The Arctic Open-Water Meeting is not specifically required by statute or regulation. However, NMFS has continued to organize this annual meeting because of the importance of stakeholder input and interaction in NMFS' determination of whether a specific activity will likely have an unmitigable adverse impact on subsistence uses. The meeting allows the public to provide input on industry proposals while the federal agencies that are responsible for authorizing the activity itself and the incidental take of marine mammals can listen to those comments and participate in the interaction.

There is a separate monitoring plan peer review session that is required to be held. The meeting usually occurs immediately after the Arctic Open-Water meeting.

5.4 Adaptive Management

NMFS and BOEM historically used, and will likely use in the future, adaptive management principles in the issuance of permits and authorizations and any adaptive adjustments of mitigation and monitoring. The intent of adaptive management here is to ensure:

- (1) The minimization of adverse impacts to marine mammals, subsistence uses of marine mammals, endangered species, and other protected resources, within the context of the associated regulations and statutes;
- (2) The maximization of value of the information gathered via required monitoring; and
- (3) Industry compliance with environmental protection statutes and regulations.

Following are some of the specific sources of information upon which adaptive management decisions could be based in the next five years (2012 through 2017):

- (1) Results of monitoring required pursuant to MMPA ITAs or other Federal statutes for Arctic oil and gas development activities;
- (2) Stakeholder input during the annual Arctic Open-Water Meetings;
- (3) Scientific input from the independent peer review;
- (4) Public input during comment periods on MMPA authorizations;
- (5) Results from BOEM's Environmental Studies Program;
- (6) Results from general marine mammal and sound research;
- (7) Results from the efforts of the NOAA Working Groups working on Underwater Soundmapping and Cetacean Mapping in the Arctic and elsewhere;
- (8) Results of the BP Cumulative Impact modeling of multiple sound sources in the Beaufort Sea; and
- (9) Any information that reveals that marine mammals may have been taken in a manner, extent, or number not authorized.