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February 8, 2012

Steven Textoris
5-Year Program Manager
Bureau of Ocean Energy Management (MS-4010)
Room 3120
381 Elden Street
Herndon, Virginia 20170

RE: The Proposed Outer Continental Shelf Oil and Gas Leasing Program for 2012–2017

Dear Mr. Textoris:

Oceana appreciates the opportunity to submit comments on the Proposed Outer Continental Shelf (OCS) Oil and Gas Leasing Program for 2012–2017 ("Proposed Program").[1] As the *Deepwater Horizon* tragedy unfortunately demonstrated, we lack important information about the marine environment, are not prepared to respond to a spill, and do not make good decisions about the risks and benefits of offshore industrial activities. These failings are amplified in the Arctic, where even very basic information is missing about the marine ecosystems, there is a clear lack of demonstrated oil spill response equipment, and potential activities will occur in remote locations subject to dangerous weather conditions. Rather than continuing to schedule lease sales and authorize activities in the Arctic and Gulf of Mexico in the absence of good information, the Bureau of Ocean Energy Management (BOEM) should commit to comprehensive planning, based on science, preparedness, and a fair balancing of risks and benefits. The agency can begin that process in earnest by reconsidering the Proposed Program, scheduling no lease sales in the Gulf of Mexico planning areas until at least 2014, and scheduling no lease sales in the Chukchi Sea and Beaufort Sea planning areas.[2]

In addition to this letter, you are also receiving individual comments from more than 19,500 Oceana members and supporters opposing inclusion of Arctic lease sales in the 2012-17 Program and supporting comprehensive planning based on science and preparedness.

Oceana submitted extensive comments on the draft Programmatic Environmental Impact Statement (DPEIS) accompanying the Proposed Program.[3] Many of the issues identified in those

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[1] *See* 76 Fed. Reg. 70,156 (Nov. 10, 2011); U.S. Department of the Interior. Bureau of Ocean Energy Management, *Proposed Outer Continental Shelf Oil and Gas Leasing Program: 2012-2017* (2011), *available at* http://www.boem.gov/5-year/2012-2017 (hereinafter "Proposed 2012-17 Program").

[2] These comments are consistent with and incorporate: comments submitted on behalf of several community and conservation organizations, including the Alaska Wilderness League and comments focused on the Arctic Ocean submitted on behalf of Pew Environment Group, Ocean Conservancy, Audubon-Alaska, and Oceana. The background and substance of those comments is not repeated here.

[3] *See* U.S. Department of the Interior, Bureau of Ocean Energy Management, *Outer Continental Shelf Oil and Gas Leasing Program: 2012-2017, Draft Programmatic Environmental Impact Statement* (2011), *available at* http://www.boem.gov/5-year/2012-2017/PEIS.aspx (hereinafter "Draft PEIS").

letters are applicable to the Proposed Program, and the comments are attached to this letter as Appendix A. In addition to those letters, BOEM also received individual comments on the DPEIS from more than 29,629 Oceana members and supporters opposed to leasing in the Arctic.

This letter builds on the comments we submitted during the DPEIS process. It emphasizes BOEM's obligation to fully and fairly depict the risks and benefits of making various areas of the Outer Continental Shelf (OCS) available to oil companies and to fulfill the agency's obligations as steward of our public resources. More specifically, BOEM must fundamentally re-think the manner in which it estimates the Net Present Value of the various Program alternatives considered and must more effectively incorporate the risk of, and potential impacts from, a catastrophic spill. The agency must also ensure that it is considering the best scientific information in order to better identify and protect important ecological and subsistence areas. To help in that process, this letter includes information about the distribution of marine mammals that is an example of the type of information needed and that can help guide the agency's decisions about deferring areas and restricting activities.

I. BOEM MUST FUNDAMENTALLY RECONSIDER THE MANNER IN WHICH IT ESTIMATES THE COSTS AND BENEFITS OF PROPOSED PROGRAM ALTERNATIVES.

As explained in detail in scoping comments and our comments on the DPEIS, BOEM must more fairly evaluate the risks and benefits of offshore leasing, exploration, and development. We raised several specific concerns in those letters about the Net Present Value (NPV) analysis and presentation in the Proposed Plan and the socioeconomic information in the DPEIS. Those comments are not repeated here, and BOEM must remedy the deficiencies we identified.[4] In this letter, we expand on those comments by identifying additional problems with the manner in which BOEM has estimated the benefits to the American people from the proposed activities and the manner in which the agency's analysis addresses uncertainty. We also discuss the need to more effectively evaluate the potential impacts from a catastrophic spill and to make available to the public the information and assumptions underlying these analyses.

The discussion of Net Present Value and the agency's analysis of costs and benefits in this and our previous letters largely summarize findings from a 2012 report entitled "Net Public Benefits Analysis of the Proposed Outer Continental Shelf Oil & Gas Leasing Program: A Critique." That report, prepared by Center for Sustainable Economy, is attached as Appendix B.

[4] In particular, BOEM must revisit its analysis of the "no action alternative" in order to more fully depict the potential benefits of no action, ensure that costs are depicted appropriately for the Arctic region, appropriately incorporate conservation and efficiency, and include a discussion of option value. BOEM also must ensure that it presents accurate information about the costs of the Proposed Program. Once it corrects those failings, BOEM must include information about NPV in the final PEIS. See Appendix A for a more detailed explanation of these deficiencies.

A. BOEM Has Substantially Overstated the Potential Benefits of the Proposed Program.

One important justification given for authorizing offshore activities in the Proposed Program is the potential for significant economic benefit to the country. That justification, however, is valid only insofar as the agency has undertaken a rigorous analysis of those perceived benefits. Based on the information made available to the public, it appears that BOEM has made several questionable decisions that, together, significantly overstate the potential gains from the Proposed Program. Specifically, BOEM has included private industry profits as public benefits, made questionable assumptions about the effects of production from the 2012-17 Program on prices, and included foreign consumer surplus as a benefit to the American public. As explained in more detail in Appendix B to this letter, remedying just the first and third of these problems could reduce the estimated benefits of the Proposed Program by $31-227 billion.

First, a major share—between 47 and 78 percent—of net public benefits reported in BOEM's analysis is represented by industry profits. Oil company profits are not benefits to the country, and including private profits in a net public benefits analysis is inconsistent with both professional and legal standards. Even if BOEM could rationalize this seemingly inconsistent approach, profits that are enjoyed by foreign entities clearly must be excluded. Presently, there is no easy way to predict what this share will be over the life of the Program, but it is likely to be substantial. For example, more than 87% of the acreage associated with existing leases in Alaska waters is held by foreign companies, and foreign-held companies are frequent bidders in the Gulf of Mexico. At a minimum, therefore, the share of the benefits, which is likely substantial, that BOEM estimates will be generated by foreign-owned entities cannot be counted as a benefit to the American public.[5]

The second major component of the benefits that might accrue from the Proposed Program is the consumer surplus that could result from lower prices of final products produced from oil and gas generated under the program. At least some substantial portion of these benefits are not likely to accrue given that the United States cannot directly influence prices by way of its supply in international oil markets.[6] U.S. demand for oil is a significant factor in oil prices, but domestic supply has a negligible effect. The combined effect of large U.S. demand as a share of global demand and minor U.S. production as a share of global production leads to negligible price benefits from increased domestic production.[7]

BOEM's consumer surplus benefit estimates also fail to account for exports of petroleum products refined from OCS oil. The analysis "is confined to a national, U.S. perspective." Under the no action scenario, for example, BOEM assumes that American consumers will substitute increased imports from abroad, various domestic sources, and demand reduction if OCS production does not occur. The substitutions account for 100% of OCS production, which means that the model assumes that all final products will be consumed domestically. A substantial portion of final petroleum products refined from OCS oil, however, will be exported.

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[5] See Appendix B at 11-12 and Tables A3-1 and A3-2 for additional detail.
[6] The consumer surplus estimates associated with natural gas are more plausible because the United States produces a sizable portion of the global total and nearly the same amount that is consumed domestically.
[7] See Appendix B at 12-13 for additional detail and citations.

While exports of crude oil products from OCS lands are for the most part prohibited, there are no such restrictions on the final consumer products, and in recent years, the United States has become a major exporter. For the week ending 1/20/12, for example the U.S. Energy Information Administration reports that the United States exported an average of 2,884,000 barrels of final petroleum products per day while importing only 2,201,000 barrels.[8] BOEM must address this issue in its estimates of consumer surplus.[9]

In addition, BOEM's analysis was completed without any consideration of federal, state, and local policies that might influence demand, supply, and price. A rigorous analysis would address policies affecting supply of one source relative to another, and policies affecting displacement in consumption of one source over another. At a minimum, such policies should be included as part of a rigorous sensitivity analysis, whereby key assumptions (i.e., the price and supply of substitutes) are altered to account for uncertainty. BOEM should undertake such a sensitivity analysis and make its results available for review.

B. <u>BOEM Can More Effectively Include the Environmental and Social Costs of a Catastrophic Spill.</u>

In Appendix B of the Proposed Program, BOEM presents its "proposed general approach to the consideration of the potential environmental and social costs" for catastrophic spills.[10] Accurately and fully estimating the environmental and social costs of a catastrophic spill is crucial to fully accounting for the potential costs of the Proposed Program, and BOEM is to be congratulated for making a first attempt to do so. There are several ways in which this analysis should be improved.

First, the environmental and social costs of catastrophic spills can be influenced by numerous factors, including distance to shore, water depth, OCS planning area, and time of year.[11] To address this potential variability in costs, BOEM should analyze and present the costs of a catastrophic spill in each planning area under various combinations of these factors. By doing so, BOEM will be able to consider the full range of potential costs of a catastrophic spill.

Second, BOEM omits several potential types of impacts that could be significant and should be included. In describing the broad categories of impacts, for example, BOEM fails to include indirect impacts on physical and biological resources, which can be significant.[12] BOEM also fails to include potential direct and indirect effects from subsea plumes as potential effects of catastrophic spills on physical and biological resources.[13] Subsea oil plumes as large as 22 miles long and 700 feet thick resulted from the Deepwater Horizon spill. These chemicals in these plumes were comprised mostly of the toxic chemicals benzene, toluene, ethylbenzene, and total

[8] *See* U.S. Energy Information Administration, Weekly Imports and Exports of Petroleum and Other Liquids, *available at* http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=WRPIMUS2&f=W.
[9] See Appendix B at 14-15 for additional detail and citations.
[10] Proposed Program at 188.
[11] *See id.*
[12] *See id.* at 190.
[13] *See id.* at 191-92.

xylenes ("BTEX") and could directly adversely impact mesopelagic and benthic resources. These effects, in turn, could impact other resources. BOEM must consider such direct and indirect effects of subsea plumes in its catastrophic spill costs analysis. In addition, BOEM should more effectively consider the costs of response actions, including dispersant use and in situ burns.

Finally, BOEM appears to ignore the difference in scale between the impacts from a catastrophic blowout and a tanker spill. A blowout, of course, would likely discharge more oil than a tanker spill and, therefore, would likely have a greater environmental impact. Failing to differentiate between the scale of impacts likely leads to erroneous conclusions of the Program's potential effects.

C. BOEM Should Make Available to the Public the Models and Assumptions Used in Estimating the Risks and Benefits.

President Obama has stated that government transparency and public participation are important to his administration.[14] We encourage BOEM to heed those directives and to make available to the public all information that has been used in developing the Proposed Program and DPEIS. In particular, BOEM should divulge the Market Simulation Model ("MarketSim") and the assumptions used in the modeling employed for the Five-Year Program process. BOEM uses MarketSim to estimate the economic impact of the Five-Year Program and its alternatives. Neither the model nor its underlying detailed technical data and forecasting methods, however, have been made available to the public. In the interests of transparency and to facilitate a thorough review by stakeholders, BOEM should make this information available to the public prior to completing the planning and EIS processes.

Further, Oceana submitted a request for documents pursuant to the Freedom of Information Act (FOIA) that was received by BOEM on November 23, 2011. We requested documents regarding the "benefit-cost analysis" in the Proposed Program and the analysis of "Potential Impacts on Population, Employment, and Income" in the DPEIS. Although the 20-day statutory deadline has passed, we have not yet received any documents responsive to this request. We encourage BOEM to make these documents available in a timely manner.

II. BETTER SCIENCE ABOUT THE DISTRIBUTION OF MARINE MAMMALS IS AVAILABLE TO HELP GUIDE DECISIONS IN THE ARCTIC.

Courts, communities, scientists, the National Commission on the Deepwater Horizon Oil Spill and Offshore Drilling, and, most recently, the U.S. Geological Survey (USGS) have all recognized the urgent need to gather missing scientific information to help guide decisions about industrial activities in the Arctic. In particular, the USGS concluded that "[r]elatively little is known about the Arctic in large part because many of the studies are targeted in focus and

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[14] *See, e.g.*, Memorandum for the Heads of Executive Departments and Agencies, 74 Fed. Reg. 4,683 (Jan. 26, 2009); Memorandum from the Attorney General to Heads of Executive Departments and Agencies, *Subject: The Freedom of Information Act (FOIA)* (Mar. 19, 2009).

independently conducted with limited synthesis, even within studies on the same topics. There is a critical need for large-scale synoptic efforts that synthesize the many different studies on the full range of topics by the numerous researchers and organizations examining the Arctic."[15] We should heed these directives and commit to obtaining the needed scientific information, including efforts to synthesize existing information.

As an effort to build on the Arctic Marine Synthesis[16] and further synthesize existing information, Appendix C contains a series of draft maps highlighting the seasonal concentration areas for marine mammal species in U.S. Arctic waters north of 68 degrees latitude. These maps are an update from those that were included in Oceana's comments on the DPEIS and are attached here in Appendix A. BOEM should use these maps and other data to help: 1) choose an alternative that ensures that actions resulting from the Proposed Program will not cause negative impacts to marine mammal concentration areas; and 2) assess the potential impacts to these areas, and to marine mammals in general, for each alternative; and 3) begin the process to identify important areas requiring deferral and other protections.

Marine mammals play an integral role in the cultures, personal health and economic well-being of thousands of Americans who live along Arctic shores. Those animals that migrate long distances to and from the Arctic, such as gray whales, also benefit communities throughout the U.S. west coast through tourism and as part of the overall quality of life for many coastal citizens.

As primary consumers at or near the top of the food chain, marine mammals also are critical in the structure and functioning of Arctic marine ecosystems. In most cases Arctic marine mammals are long-lived species with low reproduction rates, and many marine mammal species fill multiple roles within Arctic ecosystems. As a result, impacts to one species, or damage from an oil spill or other accident to a specific area where those species concentrate, are likely to have harmful effects not only to an individual species, but throughout the ecosystem.[17]

Even though the information contained on the marine mammals maps remains in draft form, it is essential data for developing responsible management measures that will maintain the health of Arctic marine mammal populations and the ecosystem in general. The information builds on the recent Alaska Marine Synthesis prepared by Audubon Alaska in cooperation with Oceana, with updated information to incorporate much of the recent tagging work and additional suggestions from marine mammal experts.

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[15] Holland-Bartels, Leslie, and Pierce, Brenda, *An evaluation of the science needs to inform decisions on Outer Continental Shelf energy development in the Chukchi and Beaufort Seas, Alaska*: U.S. Geological Survey Circular 1370, 218 (2011); *see also id.* at 221 ("[A] collaborative and comprehensive Arctic science planning process would bring great value to the decisions required to proceed with development of oil and has and other strategic assets in the Arctic in a changing climate environment.").
[16] Smith, M.A., 2010, Arctic marine synthesis—Atlas of the Chukchi and Beaufort Seas: Anchorage, Alaska, Audubon Alaska and Oceana.
[17] Bertness, M. D., S. D. Gaines, and M. Hay (Editors). 2001. Marine Community Ecology. 550 pages, Sinauer Associates, Sunderland, Massachusetts. *See generally*.

While the maps are based primarily on “western” science, there is some data included from a handful of studies documenting the Local and Traditional Knowledge of Arctic peoples and communities. Oceana has been working with indigenous and community organizations to further document Local and Traditional Knowledge of marine mammals. Local and Traditional Knowledge is an equally valid source of information for understanding Arctic marine mammal abundance, distribution and life history, and is especially critical in the Arctic where there are so many gaps in western scientific information.[18]

It is also important to note that, while these maps represent our best understanding, there is relatively sparse information in many cases. For example, the summer distributions of bearded seals are based in part on only a few tagged animals. For most marine mammal species in the Arctic, there is not adequate information to even provide good estimates of population size. This is another example of the clear need for a more comprehensive gap analysis (furthering the work done in the recent USGS review) to be undertaken by an independent entity, such as the National Research Council, and the establishment of a comprehensive research program for the region.

BOEM must incorporate all available information, including the enclosed data on marine mammal use of specific areas at specific times, to avoid any potential impacts to these essential species and the areas most important to their long-term health and resilience. BOEM must also assess gaps in data or lack of information that create the potential for unexpected and undue harm to the health of the ecosystem and subsistence way of life that might have been more effectively prevented by better information.

III. CONCLUSION

For the reasons explained above and others, BOEM must reconsider the Proposed Program, schedule no lease sales in the Gulf of Mexico planning areas until at least 2014, and schedule no lease sales in the Chukchi Sea and Beaufort Sea planning areas. Rather than continuing the piecemeal approach to decision-making, BOEM should use the next five years to develop a vision for our offshore areas, commit to the science necessary to guide good decisions, more fairly evaluate the risks and benefits of proposed industrial undertakings, and develop and demonstrate response technologies. With better information and planning, BOEM could move away from the ongoing controversy and litigation and toward a lasting solution that protects healthy ocean ecosystems and provides clean energy.

Sincerely,

Michael F. Hirshfield, Ph.D.
Senior Vice President, North America & Chief Scientist
Oceana

[18] Huntington, H. P. 2000. Using traditional ecological knowledge in science: methods and applications. Ecological Applications 10:1270-1274.

APPENDIX A:

OCEANA COMMENTS ON THE DRAFT PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT

OCEANA | Protecting The World's Oceans.

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January 9, 2012

Mr. James F. Bennett
Chief of the Division of Environmental Assessment
Bureau of Ocean Energy Management
Headquarters, 381 Elden St.
Herndon, VA 20170

RE: Draft Programmatic Environmental Impact Statement for the Proposed Outer Continental Shelf Oil and Gas Leasing Program for 2012–2017

Dear Mr. Bennett:

Oceana appreciates the opportunity to submit comments on the Draft Programmatic Environmental Impact Statement (PEIS) for the Proposed Outer Continental Shelf (OCS) Oil and Gas Leasing Program for 2012–2017 ("2012–17 Program" or "Proposed Program").[1] As the *Deepwater Horizon* tragedy unfortunately demonstrated, we lack basic information about the marine environment, are not prepared to respond to a spill, and do not make good decisions about the risks and benefits of offshore industrial activities. These failings are amplified in the Arctic, where the most basic information is missing about the marine ecosystems, there is a clear lack of demonstrated oil spill response equipment, and potential activities will occur in remote locations subject to dangerous weather conditions. Rather than continuing the piecemeal approach to decisions about our Arctic resources, the Bureau of Ocean Energy Management (BOEM) should commit to comprehensive planning based on science, preparedness, and a fair balancing of risks and benefits. For these reasons and others, BOEM should schedule no lease sales in the Chukchi Sea or Beaufort Sea planning areas in the 2012-17 Program.[2]

In addition to this letter, you are receiving individual comments from more than 29,000 Oceana members and supporters opposing inclusion of Arctic lease sales in the 2012-17 Program and supporting comprehensive planning based on science and preparedness. These individual comments have been submitted separately.

[1] See 76 Fed. Reg. 70,156 (Nov. 10, 2011); U.S. Department of the Interior, Bureau of Ocean Energy Management, *Outer Continental Shelf Oil and Gas Leasing Program: 2012-2017*, *Draft Programmatic Environmental Impact Statement* (2011), *available at* http://www.boem.gov/5-year/2012-2017/PEIS.aspx (hereinafter "Draft PEIS"); U.S. Department of the Interior, Bureau of Ocean Energy Management, *Proposed Outer Continental Shelf Oil and Gas Leasing Program: 2012-2017* (2011), *available at* http://www.boem.gov/5-year/2012-2017 (hereinafter "Proposed Program").

[2] These comments focus on the Arctic Ocean and are consistent with and incorporate: comments submitted on behalf of Pew Environment Group, Ocean Conservancy, Audubon-Alaska, and Oceana; comments submitted on behalf of several community and conservation organizations, including the Alaska Wilderness League; and a separate letter focused on the Gulf of Mexico and submitted on behalf of Oceana and others. The background and substance of those comments is not repeated here.

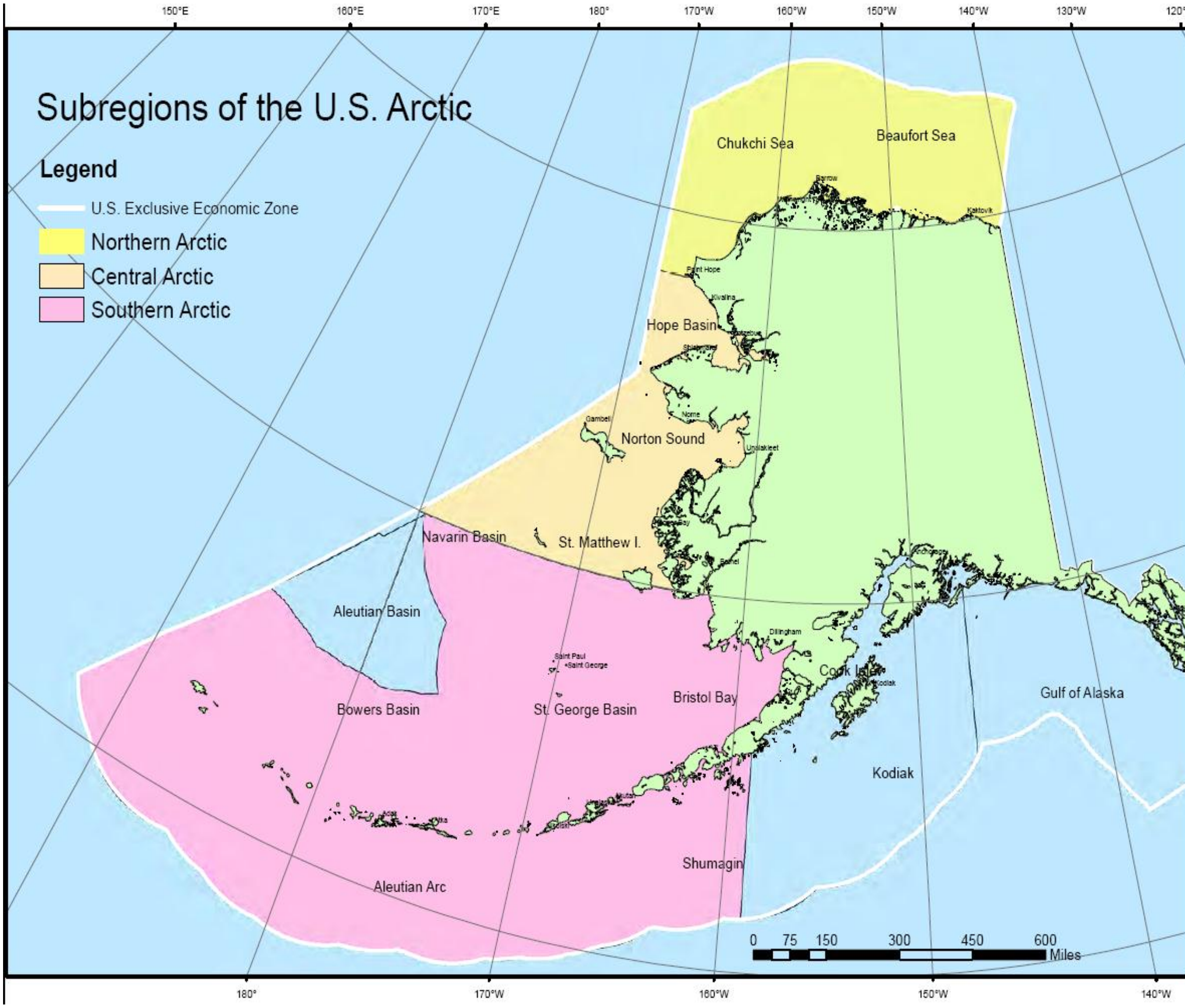
As the agency prepares the 2012-17 Program and accompanying PEIS, BOEM must ensure that decisions are based on the best available information. In particular, BOEM must fully and fairly depict the risks and benefits of the alternatives considered and must craft a Five-Year Program that satisfies the agency's obligations as a steward of our public resources. As explained in our scoping comments and expanded below, the agency has not met this standard and should revisit the manner in which it calculates and presents the costs and benefits of holding lease sales in the Arctic. Further, in order to make good decisions about whether to hold lease sales and, if so, under what conditions, the agency must better identify important ecological and subsistence areas. Below, we present information about the distribution of marine mammals that is an example of the type of information needed and that can help guide the agency's decisions about deferring areas and restricting activities.

I. BOEM SHOULD NOT INCLUDE SALES IN THE CHUKCHI SEA OR BEAUFORT SEA PLANNING AREAS AND, INSTEAD, SHOULD COMMIT TO COMPREHENSIVE PLANNING FOR THE ARCTIC.

There is a clear need for long-term, comprehensive planning for the Arctic Ocean that is based on good science and preparedness and that acknowledges the complexity, importance, remoteness. and sensitivity of the region. The interconnected nature of Arctic marine ecosystems demands a holistic approach based on protecting the overall health of the Arctic and fairly assessing the risks and benefits associated with industrial activities in the region. The ongoing process of granting piecemeal approvals for industrial undertakings in the Arctic has led to controversy and created the very real risk that significant impacts will not be evaluated or detected. Rather than continuing this approach, the Obama administration must consider the region as a whole and craft a plan for healthy oceans and clean energy in the Arctic.

A comprehensive plan must include the entire Arctic region and acknowledge differences in the included areas. America's Arctic includes all U.S. territory "north of the Arctic Circle and . . . north and west of the boundary formed by the Porcupine, Yukon, and Kuskokwim Rivers; all contiguous seas, including the Arctic Ocean and the Beaufort, Bering and Chukchi Seas; and the Aleutian chain."[3] Arctic marine waters are diverse, and, for planning purposes, they can be considered as the series of ecologically interconnected subregions depicted on the following map:[4]

[3] 15 U.S.C. § 4111.
[4] This map was included with scoping comments submitted on behalf of several organizations regarding the National Ocean Council's Arctic Strategic Plan. It reflects the thinking and work of those signatory organizations.



Decisions about our ocean resources should be based on a holistic vision that encompasses all three subregions and the overlapping but different resources in, and threats facing, each. BOEM cannot make good decisions about oil and gas activities, for example, without a decision-making framework that encompasses other threats, such as shipping, fishing, and climate change. Such a framework should include all threats and resources in all subregions.

Further, a lasting vision that protects healthy oceans and provides clean energy and economic opportunity is viable only if based on good scientific information that allows us to understand the potential in-the-water impacts of different choices. Courts, communities, scientists, the National Commission on the Deepwater Horizon Oil Spill and Offshore Drilling, and, most recently, the U.S. Geological Survey (USGS) have all recognized the urgent need to gather missing scientific information to help guide decisions about industrial activities in the Arctic. In particular, the USGS concluded that “[t]here is a continuing need to facilitate the collection, integration, and sharing of multi-scale data sets to advance our understanding of the Arctic as a complex, interdependent system. Such multidisciplinary data sets need to be used to develop comprehensive, holistic approaches to resource development and impact scenarios to inform planning."[5] We should heed these directives and commit to obtaining the needed scientific information.

We also must step away from the fiction that, currently, it is possible to respond effectively to a major spill in the Arctic. There is not sufficient infrastructure to handle such a response, and there has never been a successful demonstration of response technology in Arctic waters. In fact, the last in-the-water test was in 2000, and it was deemed a failure.[6] We should not approve any further offshore activities until the necessary equipment and trained personnel are in place and the technology has been shown to be effective.

Rather than repeat the same mistakes made in the past, the agency should use this program as a step toward broader planning and reform. The next five years could be used to gather necessary science, demonstrate response capabilities, and integrate decisions about oil and gas activities into a larger planning framework for the Arctic. With that information and new direction, BOEM would be in a better position to make good decisions about whether to hold additional lease sales and, if so, under what conditions.

II. BOEM HAS NOT INCLUDED THE BEST INFORMATION ABOUT RISKS AND BENEFITS IN THE PROPOSED 2012-17 PROGRAM OR DRAFT PEIS.

As explained in our scoping comments, BOEM can, and must, more fairly evaluate the risks and benefits of offshore leasing, exploration, and development. In particular, the agency can better evaluate and present potential economic costs and benefits of the alternatives under its consideration. We raised several specific concerns in our scoping comments, and BOEM has not addressed them. Indeed, the Net Present Value (NPV) analysis in the Proposed Plan and the socioeconomic information in the PEIS largely mirror those from previous Five-Year Programs. As an initial matter, therefore, BOEM should revisit those analyses and remedy the deficiencies identified in our scoping comments. In addition, BOEM must revisit its analysis of the "no action alternative" in order to more fully depict the potential benefits of no action, ensure that costs are depicted appropriately for the Arctic region, appropriately incorporate conservation and efficiency, and include a discussion of option value. BOEM also must ensure that it presents accurate information about the costs of the Proposed Program. Once it corrects those failings, BOEM must include information about NPV in the final PEIS.

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[5] Holland-Bartels, Leslie, and Pierce, Brenda, *An evaluation of the science needs to inform decisions on Outer Continental Shelf energy development in the Chukchi and Beaufort Seas, Alaska*: U.S. Geological Survey Circular 1370, 220 (2011); *see also id.* at 221 ("[A] collaborative and comprehensive Arctic science planning process would bring great value to the decisions required to proceed with development of oil and has and other strategic assets in the Arctic in a changing climate environment.").

[6] *See, e.g.,* Oceana, et al., "Most Recent Test of Oil Spill Response in US Arctic Called 'Failure,'" http://na.oceana.org/en/news-media/press-center/press-releases/most-recent-test-of-oil-spill-response-in-us-arctic-called-failure.

A. Background

A Five-Year Leasing Program must "obtain a proper balance between the potential for environmental damage, the potential for the discovery of oil and gas, and the potential for adverse impact on the coastal zone."[7] It must be "conducted in a manner which considers economic, social, and environmental values of the renewable and nonrenewable resources contained in the [OCS], and the potential impact of oil and gas exploration on other resource values of the [OCS] and the marine, coastal, and human environments."[8]

Coincident with those obligations, BOEM must prepare a PEIS that "ensures that the agency . . . will have available, and will carefully consider, detailed information concerning significant environmental impacts [and] guarantees that the relevant information will be made available to the larger audience that may also play a role in both the decisionmaking process and the implementation of that decision."[9] The obligation to provide accurate information in a useful manner extends to the presentation of economic benefits and costs.[10] "The use of inflated economic benefits in this balancing process may result in approval of a project [or plan] that otherwise would not have been approved because of its adverse environmental effects."[11, 12]

As part of fulfilling these obligations, "BOEM conducts a benefit-cost analysis by program area of the social value from anticipated production of economically recoverable oil and natural gas resources expected to be leased and discovered in each program area as a result of the program."[13] This analysis concludes that the preferred alternative would result in between 49-271 billion dollars of net benefit to the American public.[14] More specifically, it shows that the decision to offer lease sales in the Beaufort Sea planning area would result in between 2.9-14.8 billion dollars of benefit; for the Chukchi, the Proposed Program is estimated to produce between 7.3-69.3 billion dollars.[15] For the reasons explained below, BOEM likely has overstated the potential benefits and underestimated potential costs. These deficiencies have created significant bias that must be corrected.

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[7] 43 U.S.C. § 1344(a)(3); *see also id.* § 1344(a)(1).
[8] *Id.* § 1344(a)(1).
[9] *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 349 (1989).
[10] *See Natural Res. Def. Council v. U.S. Forest Serv.*, 421 F. 3d 797, 811-12 (9th Cir. 2005); *Seattle Audubon Soc'y v. Lyons*, 871 F. Supp. 1291, 1324 (W.D. Wash. 1994) ("NEPA requires, where economic analysis forms the basis of choosing among alternatives, that the analysis not be misleading, biased, or incomplete.").
[11] *Hughes River Watershed Conservancy v. Glickman*, 81 F.3d 437, 446 (4th Cir. 1996); *see also Laub v. United States Dep't of the Interior*, 342 F.3d 1080, 1087 (9th Cir. 2003) (finding that a "decision to convert agricultural land and water to other uses could be influenced by an environmental analysis that properly considered [economic] effects.").
[12] In addition to its obligations under the National Environmental Policy Act (NEPA) and Outer Continental Shelf Lands Act (OCSLA), BOEM must also comply with the obligations and guidelines found in Office of Management and Budget circular A-94 and Executive Orders 13563 and 12866. *See* Office of Management and Budget (OMB), Circular A-94 (Revised): Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs *available at* http://www.whitehouse.gov/omb/circulars/a094/a094.html; Exec. Order 13563, 76 Fed. Reg. 2861 (Jan. 18, 2011); Exec. Order 12866, 58 Fed. Reg. 51735 (Oct. 4, 1993).
[13] *See* Proposed Program at 94.
[14] *Id.* at 108, Tbl 16.
[15] *Id.* at 106, Tbl. 15.

B. The Draft PEIS and Proposed Program Understate the Economic and Social Value of the No Action Alternative.[16]

One critical component of a rigorous analysis of net public benefits (NPB), like the one BOEM undertakes in the Proposed Program, is an objective evaluation of the "most likely condition expected to exist over the planning period in the absence of the plan, including any known change in law or policy."[17] This "without project scenario" should provide a point of reference against which proposed actions may be compared and is synonymous with the no-action alternative required by NEPA.[18] In an EIS, a federal agency must conduct informed and meaningful analyses of all alternatives, including no action, and specifically address how the no action alternative affects environmental impacts and the cost-benefit balance. In this regard, there are several sources of bias in both the Proposed Program and draft PEIS that work to significantly understate the economic benefits of the no-action alternative: costs of the no action alternative are included, but benefits are not; the costs of the no action alternative are unjustifiable in the three Alaska planning areas; the role of conservation and efficiency appears to be substantially underestimated; and the analysis does not include option value.

1. The costs of the no action alternative are addressed, but the benefits are excluded.

To be complete, NPB analyses must assign monetary values to both costs and benefits of each alternative under consideration. BOEM's NPB analysis, however, describes only costs of the no action alternative without including its benefits. BOEM assumes that, without an OCS leasing program, energy demand would be met from substitute sources including: onshore oil and gas production (17% of the required substitution), imports (67%), coal (6%), electricity from non-fossil sources (3%), other energy sources (2%) and reduced demand (6%).[19] This mix, under BOEM's reasoning, has higher environmental and social costs than would be incurred by filling that need through the Proposed Program. Such costs "mostly come from the risk of oil spills and air emissions from additional tanker imports and greater air emissions resulting from increased onshore production of oil, gas, and other energy substitutes such as coal."[20] These costs are the only economic value assigned to the no action alternative—any benefits are neglected altogether.

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[16] The analysis in this section and sections II.C and II.D below are summarized from a draft of a report being prepared by the Center for Sustainable Economy. That report will include a formal critique of the net public benefit analysis in the Proposed Program and other information. We expect to submit a complete version of the report with comments on the Proposed Program.
[17] *See, e.g.* WATER RESOURCES COUNCIL ECONOMIC LOSSES FROM MARINE POLLUTION – A HANDBOOK FOR ASSESSMENT 2.7.3(a) (1983).
[18] *See, e.g.*, *id.* at 1.4.9 (a) ("The without-plan condition is the condition expected to prevail if no action is taken.").
[19] U.S. Department of the Interior, Bureau of Ocean Energy Management, *Economic Analysis Methodology for the 5-Year OCS Oil and Gas Leasing Program for 2012-2017*, BOEM OCS Study 2011-050, 15 Tbl 2 (2011), *available at* http://boem.gov/Oil-and-Gas-Energy-Program/Leasing/Five-Year-Program/2012-2017/PP.aspx (hereinafter "Economic Methodology").
[20] *Id.* at 16.

This same biased characterization of the no action alternative is repeated and amplified in the draft PEIS. The draft PEIS discusses a wide range of negative environmental impacts associated with the no action alternative's energy mix including increases in oil spills, acid mine drainage, contamination of ground and surface water, and emissions of NOx, SOx, and PM from coal combustion.[21] In terms of socio-economic and socio-cultural effects, BOEM finds that "[t]he No Action Alternative would result in reduced employment and income opportunities and potentially could affect the stability and cohesion of communities and cultures."[22] The Draft PEIS also asserts that the no action alternative could "result in situations in which local infrastructure and populations could not be maintained, resulting in out-migration and a reduction in public services."[23] As with the Proposed Program, the draft PEIS ignores the potential benefits of the no action alternative.

To meet the standards for objectivity and balance, a range of benefits associated with the no action alternative should be described, quantified, and monetized. Specifically, BOEM must account for: (1) avoided costs; and (2) use and non-use values associated with lands and waters affected by offshore oil and gas activities.

BOEM likely should consider as avoided costs all of the environmental and social costs associated with the Proposed Program, including air and water quality impacts, spills, carbon emissions, and fiscal costs associated with consumption and production.[24] The no action alternative also would avoid costs associated with some fossil fuel consumption, since BOEM assumes that no action would result in a six percent reduction in demand. These avoided costs should be counted as benefits of no action.

There are other benefits that would accrue in the no action case, irrespective of costs avoided. These benefits are associated with the flow of goods and services in nature and with both active uses and passive non-uses of ecosystems that would be affected by offshore oil and gas activities. According to the draft PEIS, both on- and offshore ecosystems would be affected by the Proposed Program, including wetlands, estuaries, seagrass and kelp beds, mangroves, dunes, beaches, barrier islands, open water habitats and seafloor habitats.[25] Economists have coined the term "ecosystem services" to describe the diverse economic benefits that these ecological communities provide.[26]

These ecosystem services have values that can be measured using a range of peer-reviewed methodologies well established in the literature.[27] Many of the ecosystem types affected by the

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[21] Draft PEIS at 4-497 to 4-500.
[22] *Id.* at 4-499.
[23] *Id.* at 4-500.
[24] *See* Proposed Program at 108, Tbl 16.
[25] *See* Draft PEIS at 1-14 to 1-15.
[26] MILLENNIUM ECOSYSTEM ASSESSMENT, ECOSYSTEMS AND WELL-BEING. VOLUME 1: CURRENT STATE AND TRENDS, FINDINGS OF THE CONDITION AND TRENDS WORKING GROUP. (2005).
[27] For a summary of various techniques including contingent valuation, choice experiments, hedonic pricing, travel cost, avoided cost, replacement cost and the productivity method, see Raheem, N., et al. *The Economic Value of Coastal Ecosystems in California* (2009).

Program have been addressed.[28] BOEM also has at its disposal a range of existing studies that report ecosystem service values for specific geographic areas affected by proposed OCS leasing activities and for specific resources, such as threatened and endangered species and marine mammals.[29]

Given that ecosystem service values are substantial, measurable, and to at least some extent already estimated for lands, waters, and species affected by offshore oil and gas activities, their conspicuous absence from the DPEIS discussion or NPB analysis of the no action alternative introduces a substantial source of bias against its selection.

2. The costs of the no action alternative are unjustifiable in the three Alaska planning areas.

For the Cook Inlet, Beaufort Sea, and Chukchi Sea planning areas combined, BOEM estimates the environmental and social costs of the no action alternative would range between $150 million to $4.6 billion across the three oil price scenarios.[30] These values are 7.5 to 125 times greater than the predicted environmental and social costs associated with the Proposed Program. As previously noted, BOEM attributes the costs of the no action alternative to the risk of oil spills and air emissions from additional tanker imports and greater air emissions resulting from increased onshore production of oil, gas, and other energy substitutes such as coal.

The costs are unreasonably high because very little, if any, of this activity is likely to occur in the three Alaska planning areas—for example, nearly all U.S. oil imports are taken in by East and Gulf Coast ports. Moreover, we are incurring these risks right now. We are currently importing large quantities of oil, which is tankered to the U.S. from abroad, and production in Alaska will not reduce this risk. Oil produced offshore in the Arctic will still travel by tanker—either directly from the well or at the end of the Trans-Alaska Pipeline.

Further, BOEM uses an overly simplistic method to apportion such costs among the planning areas. "[T]he costs of the energy alternatives or substitutions are proportionally spread among the different program areas based on the amount of production expected from each area in the exploration and development scenarios."[31] As a result, Alaska planning areas are assigned up to $4.6 billion in no action alternative costs even though the vast majority of these costs would not actually be incurred within these planning areas.

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[28] *Id.* at Tbl 2.
[29] *See, e.g.,* Batker, D., et al. *Gaining Ground: Wetlands, Hurricanes, and the Economy – The Value of Restoring the Mississippi Delta.* (2010), *available at* http://www.uvm.edu/giee/publications/Batker_et_al_GainingGround_2010.pdf.
[30] *See* Proposed Program at 103, Tbl. 13.
[31] *Id.* at 102.

3. The role of conservation and efficiency in reducing future demand appear to be substantially underestimated.

One critical assumption underlying BOEM's cost estimates for the no action alternative is that demand reduction will account for just six percent of the substitutes for the oil and gas that would be foregone if the Proposed Program is not authorized.[32] This figure is questionable because it implies that the demand reduction is insensitive to price and because it does not account for innovation.

First, the six percent figure is used as a basis for analysis in all three oil price scenarios, which implies that demand reduction is insensitive to price. Historical data do not bear this out. For example, during the 2008 oil price spike, there was a reduction in demand far in excess of six percent. The combination of high oil prices hitting and a slowing economy prompted a demand reduction of approximately 1.2 million barrels per day, which was the largest such decline since the peak of the 1979 energy crisis.[33]

Second, the six percent figure does not take into account the effects of technological innovation (i.e. efficiency improvements) and policy interventions over time. While six percent may or may not be a realistic figure in the short term, we should seek greater reductions. Such reductions may be spurred by policy changes such as the recent agreement to increase corporate average fuel efficiency standards by roughly 100% over 2011 levels.[34] BOEM provides no indication that significant policy interventions were factored into the analysis.

4. The analysis does not include option value.

Neither the Proposed Program nor draft PEIS include a discussion of option value. Option value is benefit gained by deferring action in order to get better information:

> The expected net present value of a project is the mean of the distribution of probable benefits, minus the mean of the distribution of probable costs. In contexts where additional time generates information about the benefits and costs of the project, there is a value associated with waiting to act. The value of this information is the option value.[35]

In particular in the Arctic, the failure to include option value creates the potential for significant bias. "In situations where future costs and benefits of a project are uncertain, decisions are

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[32] This figure is derived from the results of the MarketSim model. *See* Economics Methodology at 15. The relevant technical data and forecasting methods behind this figure have not been disclosed.

[33] *See* Energy Information Administration, *Short Term Energy Outlook – February 2009*, *available at* http://205.254.135.24/forecasts/steo/outlook.cfm.

[34] *See* National Highway Traffic Safety Administration, "President Obama Announces Historic 54.5 mpg Fuel Efficiency Standard," (2011), *available at* http://www.nhtsa.gov/About+NHTSA/Press+Releases/2011/President+Obama+Announces+Historic+54.5+mpg+Fuel+Efficiency+Standard.

[35] New York University School of Law Institute for Policy Integrity, *The BP Gulf Coast Oil Spill, Option Value, and the Offshore Drilling Debate* 2 (2011), *available at* http://policyintegrity.org/files/publications/42011_The_BP_Gulf_Coast_Oil_Spill_Option_Value_and_the_Offshore_Drilling_Debate_1.pdf

irreversible, and the opportunity to delay action until a future date is available, cost-benefit analysis that fails to account for option value can generate inaccurate results."[36]

Further, bequest value, which is a specific type of option value, is also relevant to BOEM's analysis. Bequest value is based on the fact that the present generation derives utility (or benefit) from deferring consumption of a non-renewable resource today in order to help sustain quality of life for subsequent generations.[37] It, therefore, is an important consideration in optimizing the allocation of scarce non-renewable resources over time to foster greater intergenerational equity.[38] Given the growing scarcity of these resources, bequest values associated with OCS oil reserves can be significant and warrant inclusion as another category of benefit associated with the no action alternative. [39]

C. BOEM Understates the Costs of the Proposed Program.

BOEM's analysis does not include important costs of the Proposed Program that would be borne by the American public. In particular, the analysis does not include public financial costs borne by federal, state, and local governments and does not include the costs of important externalities, such as the carbon that would be emitted during exploration and development as well as through consumption of the oil and gas produced.

Throughout the U.S., and globally, subsidies for fossil fuel production have been the subject of extensive criticism.[40] Estimates for these costs in the United States are in the billions of dollars annually. Nonetheless, neither the Proposed Program nor draft PEIS address these costs. This exclusion represents a significant source of bias that should be remedied in the final Program analyses.

Further, neither the Proposed Program nor draft PEIS estimate the costs associated with carbon emissions. While direct emissions from leasing activities are quantified in the draft PEIS, the costs of these emissions are not incorporated into the NPB analysis despite well-established methods for doing so and a mandate to monetize externalities to the maximum extent practicable.[41] Carbon emissions associated with final consumption of OCS-derived fossil fuel

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[36] *Id.*
[37] *See, e.g.* BOARDMAN, ANTHONY E., ET AL., COST-BENEFIT ANALYSIS: CONCEPTS AND PRACTICE 216 (2001).
[38] *See, e.g.* Klepper, Gernot, *Sustainability and Intergenerational Transfers*. Kiel: The Kiel Institute of World Economics, Working Paper No. 683 (1995).
[39] For an in depth discussion of the economic consequences of rapid depletion of fossil resources, see HEINBERG, RICHARD, THE END OF GROWTH: ADAPTING TO OUR NEW ECONOMIC REALITY (2011).
[40] *See, e.g.*, "President Obama Urges Congress to Eliminate Oil Company Subsidies," *available at* http://abcnews.go.com/Politics/obama-urges-congress-eliminate-oil-company-subsidies/story?id=13462559
[41] In defending its decision not to assign a monetary value to carbon emissions, BOEM maintains that carbon emissions damage "cannot be quantified to a comparable degree with the other external costs." Economic Methodology at 9. This is a peculiar finding given that the DOI is part of a team of federal agencies that has developed methods to do so.

products are not considered at all, ostensibly, because such emissions and associate impacts on climate change have no bearing on decisions affecting the leasing program.[42]

The latter omission strongly biases the economic analysis and thus the decision making process because the benefits of final consumption are included. In particular, BOEM's estimates of consumer surplus, or the benefit consumers derive from acquiring a product for less than they are willing to pay, include "benefits afforded consumers in the form of reduced oil and gas prices generated by the incremental oil and gas supplied from the program."[43] Considering the benefits of final consumption without considering costs introduces a clear bias in favor of the Proposed Program and distorts the benefit-cost balance.

D. Once More Accurate, the NPB Information Must Be Incorporated Into the PEIS.

As discussed above and in our scoping comments, economic information that is an important part of the decision being made must be presented accurately in an EIS. Unfortunately, BOEM has not done so in the draft PEIS. Despite the important role the NPB analysis played in development of the Proposed Program and the choice among alternatives, BOEM did not include the analysis or its underlying assumptions in the draft PEIS. Its findings, assumptions, methods and data sources are not disclosed in this process and, therefore, there is no basis for public input into, or discussion of, the relationship between the NPB analysis and important unquantified impacts, values, and amenities that are presented in the draft PEIS.

This issue is exacerbated by the inclusion of socio-economic costs and benefits in the draft PEIS. As currently constructed, the PEIS does not allow for an appropriate comparison of the NPB analysis, socio-economic costs and benefits, and potential impacts to ecosystem services, option and bequest values, passive use values, or externalities, such as carbon emissions damages and public subsidies.

III. BETTER SCIENCE ABOUT THE DISTRIBUTION OF MARINE MAMMALS IS AVAILABLE TO HELP GUIDE DECISIONS

This section contains a series of maps highlighting the seasonal concentration areas for marine mammal species in U.S. Arctic waters north of 68 degrees latitude. Marine mammals are the most well-known and iconic species in the Arctic and are of vital importance to the communities and ecosystems of the Arctic.

The abundance, seasonal concentrations and migratory patterns of whales, walruses, seals and other animals are connected to the rhythms of life in Arctic communities, and have been for generations. These species play an integral role in the cultures, personal health and economic well-being of thousands of Americans who live along Arctic shores. Those animals that migrate long distances to and from the Arctic, such as gray whales, also benefit communities throughout

[42] *See* Draft PEIS at 1-18.
[43] Economic Methodology at 7.

the U.S. west coast through tourism and as part of the overall quality of life for many coastal citizens.

As primary consumers at or near the top of the food chain, marine mammals also are critical in the structure and functioning of Arctic marine ecosystems. In most cases Arctic marine mammals are long-lived species with low reproduction rates, and many marine mammal species fill multiple roles within Arctic ecosystems. As a result, impacts to one species, or damage from an oil spill or other accident to a specific area where those species concentrate, are likely to have harmful effects not only to an individual species, but throughout the ecosystem.[44]

BOEM, therefore, must incorporate all available information, including the enclosed data on marine mammal use of specific areas at specific times, to avoid any potential impacts to these essential species and the areas most important to their long-term health and resilience. BOEM must also assess gaps in data or lack of information that create the potential for unexpected and undue harm to the health of the ecosystem and subsistence way of life that might have been more effectively prevented by better information.

To accomplish this goal, BOEM should use these maps and other data to help: 1) choose an alternative that ensures that actions resulting from the Proposed Program will not cause negative impacts to marine mammal concentration areas; and 2) assess the potential impacts to these areas, and to marine mammals in general, for each alternative; and 3) begin the process to identify important areas requiring deferral and other protections.

The U.S. Geological Service Arctic science gap analysis recognized that synthesis information like this is important for guiding decisions to have less impact on the environment and the overall health of Arctic.[45] Until such information is gathered and additional science is completed, no new lease sales should be conducted in the U.S. Arctic.

<u>Important Ecological Areas of the U.S. Arctic</u>

The maps of marine mammal concentration areas included on subsequent pages are initial drafts developed by Oceana as part of a larger effort currently underway to identify Important Ecological Areas of the Arctic. Important Ecological Areas (IEAs) are geographically delineated areas which by themselves or in a network have distinguishing ecological characteristics, are important for maintaining habitat heterogeneity or the viability of a species, or contribute disproportionately to an ecosystem's health, including its productivity, biodiversity, function, structure, or resilience. IEAs include places like migration routes, subsistence areas, sensitive

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[44] Bertness, M. D., S. D. Gaines, and M. Hay (Editors). 2001. Marine Community Ecology. 550 pages, Sinauer Associates, Sunderland, Massachusetts. *See generally*.
[45] Holland-Bartels, Leslie, and Pierce, Brenda, eds., 2011, An evaluation of the science needs to inform decisions on Outer Continental Shelf energy development in the Chukchi and Beaufort Seas, Alaska: U.S. Geological Survey Circular 1370, 278 p.

seafloor habitats, concentration areas, breeding and spawning spots, foraging areas, and places with high primary productivity.[46]

Looking at marine ecosystems through the lens of IEAs can help us better understand how to preserve the health, productivity, biodiversity and resilience of marine ecosystems while providing for ecologically sustainable fisheries and other economic endeavors, traditional subsistence uses, and viable marine-dependent communities.[47]

Even though it is in draft form, this information is critical to responsible management that will maintain the health of Arctic marine mammal populations and the ecosystem in general. The information builds on the recent Alaska Marine Synthesis prepared by Audubon Alaska in cooperation with Oceana, with updated information to incorporate much of the recent tagging work and additional suggestions from marine mammal experts.

While the maps are based primarily on "western" science, there is some data included from a handful of studies documenting the Local and Traditional Knowledge of Arctic peoples and communities. Oceana has been, and hopes to continue, working with the North Slope Borough and Inuit Circumpolar Council-Alaska to further document Local and Traditional Knowledge of marine mammals in the study area. Local and Traditional Knowledge is an equally valid source of information for understanding Arctic marine mammal abundance, distribution and life history, and is especially critical in the Arctic where there are so many gaps in western scientific information.[48]

It is also important to note that, while these maps represent our best understanding, there is relatively sparse information in many cases. For example, the summer distributions of bearded seals are based in part on only a few tagged animals. For most marine mammal species in the Arctic, there is not adequate information to even provide good estimates of population size. The USGS review discussed above should be a first step toward the completion of a more comprehensive gap analysis undertaken by an independent entity, such as the National Research Council and the establishment of a comprehensive research program for the region.

These gaps in data and understanding only serve to reinforce the overall need for further scientific research and documentation of Local and Traditional Knowledge to more accurately delineate marine mammal concentration areas and identify Important Ecological Areas in the region.

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[46] Ayers et al., Important Ecological Areas in the Ocean: A Comprehensive Ecosystem Protection Approach to the Spatial Management of Marine Resources (Aug. 23, 2010), available at http://na.oceana.org/en/news-media/publications/reports/important-ecological-areas-in-the-ocean.
[47] *Id*.
[48] Huntington, H. P. 2000. Using traditional ecological knowldege in science: methods and applications. Ecological Applications 10:1270-1274.

Draft Maps of Seasonal Concentration Areas of Arctic Marine Mammals

The following pages contain distribution maps of marine mammal concentration areas for bearded seals, beluga whales, bowhead whales, gray whales, ringed seals, spotted seals and Pacific walrus. A map of ribbon seals is not included because of a lack of good information about the distribution of that species within the study region.

Concentration areas are defined as specific geographic regions where a species occurs consistently at higher densities than elsewhere within the study region or species range. As the use of the Arctic by marine mammals varies considerably throughout the year, we identified concentration areas for each season where there was sufficient data available. Concentration areas were identified directly from sources, digitized from existing studies, and/or hand drawn based on information in published studies or personal communications with experts.

The study region the maps cover is the U.S. Exclusive Economic Zone and coastal waters north of 68 degrees north. This generally encompass the Arctic region under consideration for potential lease sales in the draft 2012-17 Five-Year Plan.

Draft Maps of Overlapping Concentration Areas for each Season

In addition to maps of concentration areas for each species, we have also included maps that show the overlap of all concentration areas of the eight species for each season. Overlapping concentration areas may indicate important areas for marine mammals generally due to location, physical characteristics, relationship to seasonal sea ice cover, or other factors. These overlapping areas warrant further consideration and stronger protective measures to ensure they are not affected by oil and gas activities or other industrial impacts.

BEARDED SEALS

Bearded seals are commonly found with drifting sea ice, usually in waters less than 650 ft (200 m) deep. They are solitary animals, and individual seals rest on single ice floes facing the water for an easy escape from predators. Their lifespan exceeds 25 years, with females giving birth to a single pup while hauled out on pack-ice usually between mid-March and May. Current abundance and population trends are unknown.

While bearded seals can be found in both the Beaufort and Chukchi seas year round, a large portion of the population overwinters in the Bering Sea. Bearded seals generally move north in late-spring and summer as sea ice melts and retreats, and they then move south in the fall as sea ice forms.

In the Beaufort Sea, bearded seals are most numerous around the flaw zone between landfast and drifting pack ice. Also, from recent—but very limited—tagging data it appears that during their northward migration these animals move from Kotzebue Sound up along the coast to feed within the coastal band of the Chukchi and Beaufort seas during the summer. The included map shows the spring and summer concentration area for bearded seals in the study area.

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Arctic Alaska
Bearded Seals
25 0 25 50 75 100
miles
Spring/Summer Concentration Area
Study Area
Map Location
Arctic Ocean
RUSSIA
ALASKA
ARCTIC OCEAN
Beaufort Sea
Chukchi Sea
Barrow
Wainwright
Atqasuk
Nuiqsut
Prudhoe Bay
Kaktovik
Point Lay
Point Hope
Kivalina
ALASKA
UNITED STATES
CANADA
OCEANA

BELUGA WHALES

Beluga whales are generally found in shallow coastal waters, but they have also been seen in deep waters. Belugas can be found swimming among icebergs and ice floes in the waters of the Arctic and subarctic, where water temperatures may be as low as 32° F (0° C). They are extremely social animals that typically migrate, hunt, and interact together in groups of ten to several hundred

Their lifespan is thought to be about 35-50 years. Beluga whales mate in the spring, usually in March or April, in small bays and estuaries. Females give birth to single calves (and on rare occasion twins) every two to three years on average, usually between March and September.

Five distinct populations of beluga whales occur in the United States, all in Alaska: Cook Inlet, Bristol Bay, Eastern Bering Sea, Eastern Chukchi Sea and Beaufort Sea. The study area is home to two of those five: the Eastern Chukchi Sea population and the Beaufort Sea population. Both are currently designated as healthy populations, with the latest estimates showing approximately 3,700 individuals in the Eastern Chukchi Sea population, and 40,000 individuals in the Beaufort Sea population.

The following map shows the spring, summer and fall concentration areas for the Eastern Chukchi and Beaufort populations. In the spring, the Beaufort population uses the Chukchi Sea ice lead system while migrating to the Mackenzie River delta region in Canada. In late June, the Eastern Chukchi population gathers outside of Omalik Lagoon. They then migrate north along the coast, with concentration areas found along the coast, including in and around Barrow Canyon and near the shelf break off Point Barrow.

In addition, satellite tagging has shown that some beluga whales may travel north well offshore into the ice pack in very deep water during the summer, presumably to feed on Arctic cod. One whale was documented up to 80 degrees north in heavy ice. Other Eastern Chukchi individuals move out onto the Chukchi shelf break, as well as over into the eastern Beaufort Sea.

In early fall, satellite tagged whales from the Eastern Chukchi population clearly concentrate in Barrow Canyon as well as along the western Beaufort Sea shelf break. Satellite tagged belugas from the Beaufort Sea population indicate concentrations along the Beaufort Sea shelf break during that same time. These concentration areas of belugas are also apparent in both the aerial surveys for whales in the Chukchi Offshore Monitoring in Drilling Area project and the Bowhead Whale Aerial Survey Project in the Beaufort Sea.

Belugas are an important subsistence species for the communities of Point Lay, Point Hope, Wainwright, and Barrow. In Point Lay, there an annual, organized community hunt that provides a very large portion by weight of the subsistence food for the community each year.

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Arctic Alaska
Beluga Whales
miles
Spring Concentration Area
Summer Concentration Area
Fall Concentration Area
Map Location
RUSSIA
Alaska
ARCTIC OCEAN
Chukchi Sea
Beaufort Sea
Barrow
Wainwright
Atqasuk
Nuiqsut
Prudhoe Bay
Kaktovik
Point Lay
Point Hope
Kivalina
ALASKA
UNITED STATES
CANADA
OCEANA

BOWHEAD WHALES

Bowheads live in the Arctic Ocean and adjacent seas. They spend most of the summer in relatively ice-free waters adjacent to the Arctic Ocean and are associated with sea ice the rest of the year. The Bering-Chukchi-Beaufort, or Western Arctic, population (one of five distinctly recognized populations of bowheads) is currently estimated at 10,500 and is increasing at a rate of 3.2% per year.

Bowhead whale females generally have one calf every three to four years after a gestation period of around 13 to 14 months. The average and maximum lifespan are unknown; however, evidence indicates that individuals can live over 100 years.

The bowhead whale subsistence hunt has a central cultural role in the subsistence way of life of some coastal communities, and it plays an important role in the health and well-being of many Arctic peoples.

The enclosed map depicts seasonal concentration areas for bowhead whales within the proposed 2012-17 Program region. In the spring, bowheads migrate north through the Bering Strait, along the Chukchi Sea coast and over to the eastern Beaufort Sea to feed during the summer. During this migration bowheads concentrate in the spring in the ice lead system along the Chukchi Sea coast, which is where the bowhead whale hunt is conducted by the communities of Point Hope, Point Lay, Wainwright, and Barrow. The Local and Traditional Knowledge of hunters in Barrow and Wainwright describes consistent areas where bowheads are concentrated within this migration corridor and used for feeding and calving.

In the fall, bowheads migrate back across the Beaufort Sea along the continental shelf. Hunters have identified consistent feeding concentration areas off the barrier islands in the vicinity of Kaktovik. Bowheads also concentrate in large numbers while feeding in the region around Point Barrow during the migration.

After passing Point Barrow, bowheads then move across the Chukchi Sea, with a fair amount of variability from year to year in where they cross and how quickly they cross. There is some evidence of concentration areas of bowhead whales in the northern Chukchi Sea as they migrate, presumably to take advantage of feeding hot spots. There are also feeding concentration areas in the fall along the Russian coast of the southern Chukchi Sea, before they move through the Bering Strait for the winter.

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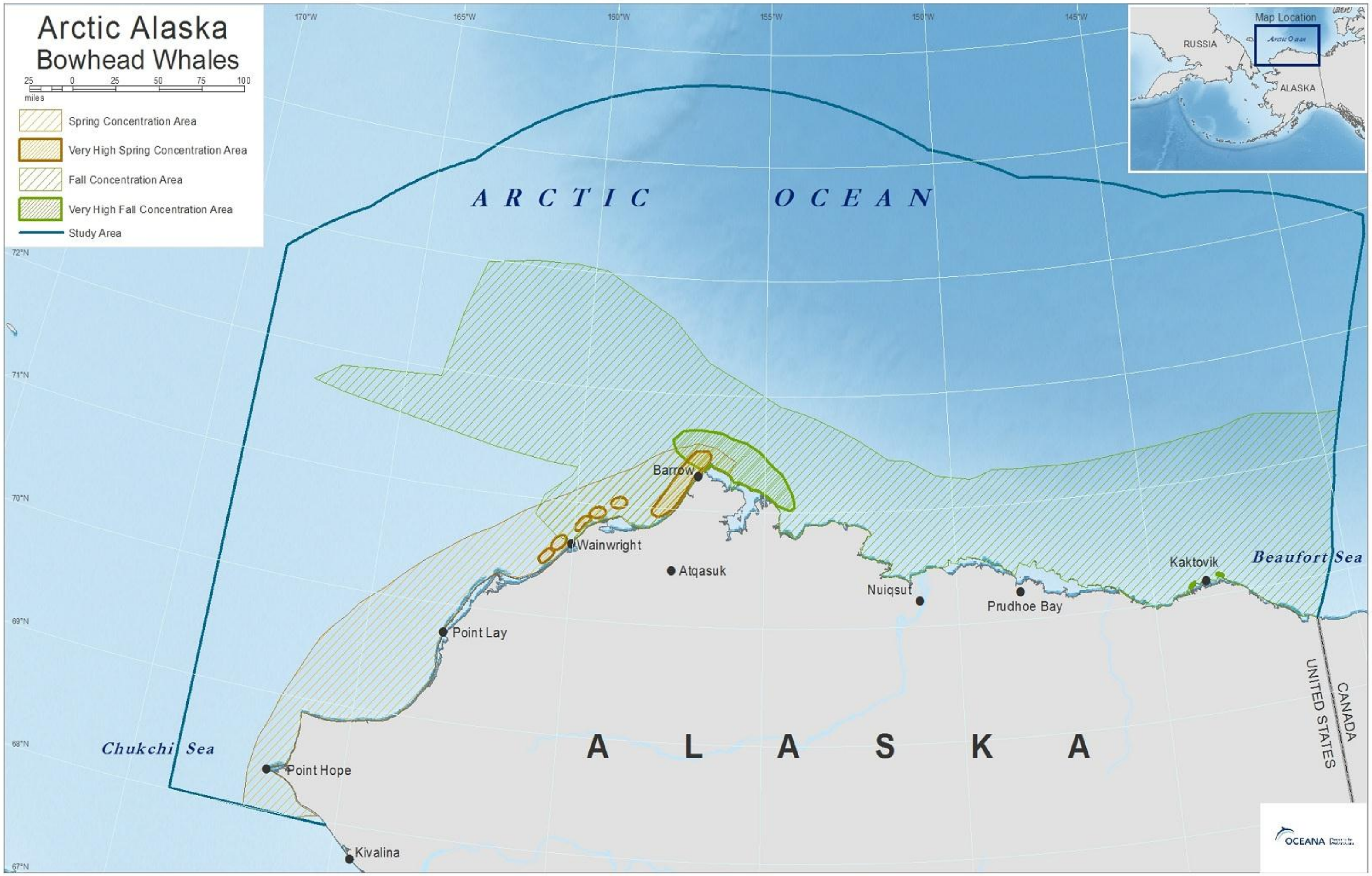
Arctic Alaska
Bowhead Whales
25 0 25 50 75 100
miles
Spring Concentration Area
Very High Spring Concentration Area
Fall Concentration Area
Very High Fall Concentration Area
Study Area
Map Location
RUSSIA
ALASKA
ARCTIC OCEAN
Barrow
Wainwright
Atqasuk
Nuiqsut
Prudhoe Bay
Kaktovik
Beaufort Sea
Point Lay
Chukchi Sea
Point Hope
Kivalina
ALASKA
UNITED STATES
CANADA
OCEANA

GRAY WHALES

Gray whales are found mainly in shallow coastal waters in the North Pacific Ocean. Most of the Eastern North Pacific population spends the summer feeding in the northern Bering and Chukchi seas and migrates between those Arctic feeding areas and their winter breeding grounds off the coast of Baja California, Mexico.

Gray whales are frequently observed traveling alone or in small, unstable groups. Large aggregations also may be seen on feeding and breeding grounds. The most recent abundance estimates for Eastern North Pacific gray whales are based on counts made during the 1997/98, 2000/01, and 2001/02 southbound migrations, and range from about 18,000-30,000 animals.

The enclosed map shows summer and fall concentration areas for gray whales in the study area. While gray whales feed primarily in the northern Bering Sea and southern Chukchi Sea, there are a handful of specific concentration areas in the northeast Chukchi Sea, specifically around Point Hope and the Wainwright, Point Franklin, and Peard Bay region.

In addition, aerial surveys conducted between 1982 and 1987 showed concentrations of gray whales in the Hanna Shoal region, which is reflected on the map. While gray whales were not seen consistently in this area in the surveys conducted between 2008 and 2010, it is important to note that the region was not surveyed between 1987 and 2008. Thus, the Hanna Shoal region is not only a potentially important concentration area for gray whales, but it also is a clear example of where gaps in the data reflect the need for further study to better understand the migratory patterns and concentrations of these animals.

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Arctic Alaska
Gray Whales
Summer/Fall Concentration Area
Study Area
ARCTIC OCEAN
Beaufort Sea
Chukchi Sea
ALASKA
Barrow
Wainwright
Atqasuk
Nuiqsut
Prudhoe Bay
Kaktovik
Point Lay
Point Hope
Kivalina
UNITED STATES
CANADA
RUSSIA
Map Location
OCEANA

PACIFIC WALRUS

Pacific walrus mainly inhabit the shallow continental shelf waters of the Bering and Chukchi seas, with distribution varying markedly with the seasons. Generally walrus occupy first-year ice with natural openings such as leads and polynyas and are not found in areas of extensive, unbroken ice.

For terrestrial haulouts, isolated sites such as islands, points, spits, and headlands are occupied most frequently. Social factors, learned behavior, and proximity to prey probably influence the location of haulout sites, but little is known about such factors.

The current size of the Pacific walrus population is unknown, and the walrus has the lowest reproductive rate of any pinniped. Pacific walrus breed in the winter between December and March, with calves born in late April or May of the following year. With pregnancies that last through the next breeding season, the minimum interval between successful births for walruses is two years.

The enclosed map depicts summer and fall concentration areas for Pacific walrus. As shown, most of these areas are in the Chukchi Sea, including important terrestrial haul out areas along the northwest coast of Alaska. Walrus primarily feed on clams or other invertebrates that live on and in the sea bottom on shallow continental shelf areas. Thus, their foraging areas are generally limited by depth to continental shelf areas and are focused on areas of high prey availability.

As the sea ice cover retreats north each spring, females, calves and juveniles stay on ice, using it as a resting platform while they feed on the seafloor of the very productive continental shelf in the northern Bering Sea and Chukchi Sea. Males tend to stay in the Bering Sea during this time, hauling out in large numbers at Round Island and elsewhere.

In early summer, females, young of the year and juveniles remain in the Chukchi Sea utilizing the still present sea ice as a resting platform while feeding. As sea ice begins to recede away from the continental shelf in late summer and fall, however, walruses will leave the ice and begin hauling out on shore to remain near the productive feeding areas of the continental shelf.

Walrus are now hauling out in very large numbers consistently on the barrier islands in the Point Lay region and in smaller numbers elsewhere between Point Hope and Point Barrow. In addition, satellite tagging shows walrus also concentrating during this time in the Hanna Shoal region, down to Herald Shoal, and in a band along the Chukchi coast. As sea ice reforms over the Chukchi Sea in the late fall and early winter, walrus move back down into the northern Bering Sea.

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Arctic Alaska
Walrus
miles
Summer/Fall Concentration Area
Summer/Fall Haul Out Area
Summer/Fall High Concentration Haul Out Area
Study Area
Map Location
RUSSIA
ALASKA
ARCTIC OCEAN
Barrow
Wainwright
Atqasuk
Nuiqsut
Prudhoe Bay
Kaktovik
Beaufort Sea
Point Lay
Chukchi Sea
Point Hope
Kivalina
ALASKA
UNITED STATES
CANADA
OCEANA

POLAR BEAR

Polar bears are the large carnivores and a unique symbol of the Arctic. Populations of polar bears are distributed in Alaska, Canada, Greenland, Norway, and Russia, with a worldwide population estimated at 22,000-25,000 bears. Two populations occur in Alaska: the southern Beaufort Sea population, shared with Canada; and the Bering Chukchi/Seas population, shared with the Russian Federation.

Polar bears generally live alone except when concentrating along the coast during the open water period mating, or rearing cubs. Polar bears' primary food are ringed seals, but they also hunt bearded seals, walrus, and beluga whales, and they will scavenge on beached carrion such as whale, walrus, and seal carcasses found along the coast.

Polar bears give birth to one to three cubs in December or January, and cubs remain with their mother for a little more than two years. Pregnant females will enter maternity dens in October or November; in Alaska, dens are excavated on either sea ice or on land.

The enclosed map shows winter concentration areas for polar bears within the study area. Along with the more general fall concentration area, winter concentration areas are divided into subsections to reflect important locations for activities like denning.

Both the Chukchi/Bering Sea and southern Beaufort Sea polar bear populations are found in the Program Area, with distribution influenced by season, ocean currents, ice and weather observations and availability of seals. Polar bears move seasonally with the ice edge, using the ice as a platform for hunting, feeding, breeding and movement. They are most abundant near coastlines and the southern extent of the ice pack.

In winter, polar bears stay along the coast, usually as far south as Saint Lawrence Island. Dens can be found on the Chukchi and Beaufort Sea coast, but denning is more concentrated along the Beaufort coast, especially near the Arctic National Wildlife Refuge. Pregnant females and newborn cubs den during winter for extended periods from late November to early April, with barrier islands particularly important for denning. Those barrier islands were designated as winter concentration areas on the enclosed map. The winter concentration areas also shows polar bear feeding areas, which is from documented Local and Traditional Knowledge of coastal villagers.

For fall, the map depicts the core use area of polar bears in the study region from Armstrup et al. 2005. In the summer polar bears are generally found offshore following the receding pack ice in the Arctic, with individual bears roaming over very large areas.

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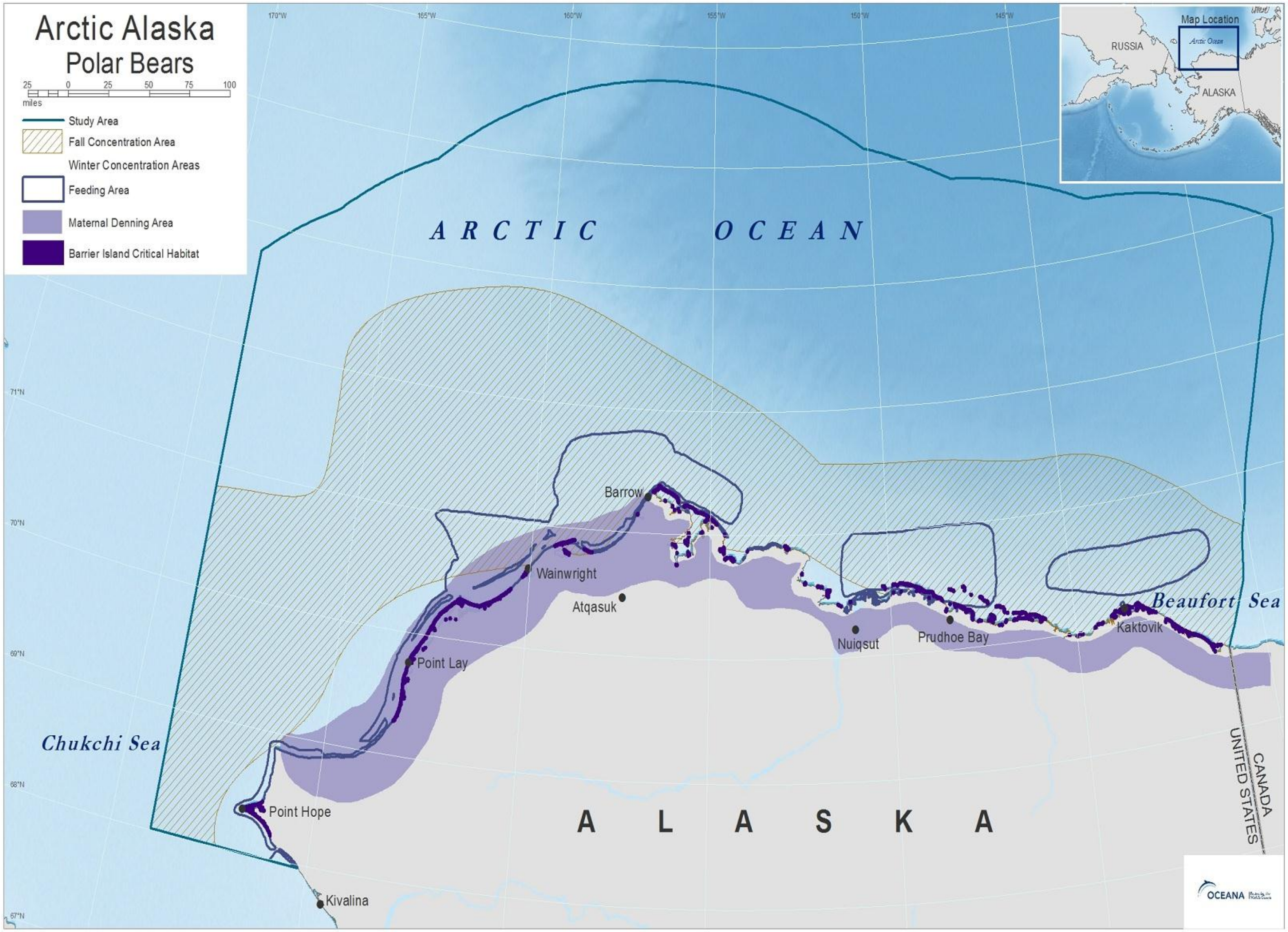
Arctic Alaska
Polar Bears
25 0 25 50 75 100
miles
Study Area
Fall Concentration Area
Winter Concentration Areas
Feeding Area
Maternal Denning Area
Barrier Island Critical Habitat
Map Location
RUSSIA
ALASKA
ARCTIC OCEAN
Chukchi Sea
Beaufort Sea
Barrow
Wainwright
Atqasuk
Point Lay
Point Hope
Kivalina
Nuiqsut
Prudhoe Bay
Kaktovik
ALASKA
UNITED STATES
CANADA
OCEANA

RINGED SEALS

Ringed seals reside in Arctic waters and are commonly associated with ice floes and pack ice. They are solitary animals and, when hauled out on ice, separate themselves from each other by hundreds of yards. During the spring breeding season, females construct lairs within the thick ice and give birth to a single pup in March or April. Ringed seals live about 25 to 30 years, and the estimated population size for the Alaska population of ringed seals is 249,000 animals. The population trend for the Alaska stock is unknown.

Ringed seals are well adapted to occupying seasonal and permanent ice. They tend to prefer large floes and are often found in the interior ice pack where the sea ice coverage is greater than 90%.

Surveys in late winter and spring indicate ringed seal densities and concentration areas are most numerous in nearshore fast and pack ice. In particular, surveys from the Beaufort Sea indicate that densities tend to be highest around the fracture zone between the fast ice and the pack ice.

Satellite tagging of ringed seals indicates that ringed seals often disperse broadly for the open water period in the summer and fall, presumably to forage in highly productive areas. Unfortunately, data is limited on where there may be foraging concentration areas within the study area. This is another example of the kind of information that is sorely needed to fully assess the impacts of any offshore development.

The enclosed map shows the winter and spring concentration area for ringed seals.

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Arctic Alaska
Ringed Seals
25 0 25 50 75 100
miles
Spring/Winter Concentration Area
Study Area
Map Location
RUSSIA
ALASKA
ARCTIC OCEAN
72°N
71°N
70°N
69°N
68°N
Barrow
Wainwright
Atqasuk
Nuiqsut
Prudhoe Bay
Kaktovik
Beaufort Sea
Point Lay
Chukchi Sea
Point Hope
Kivalina
ALASKA
UNITED STATES
CANADA
OCEANA

SPOTTED SEALS

Spotted seals prefer Arctic or subarctic waters, and they are often found within the outer margins of shifting ice floes. Rarely do they inhabit areas of dense pack ice. Spotted seals range from the coast of Alaska throughout the Bering Sea, Sea of Japan, and Sea of Okhotsk.

During breeding season between January and mid-April, spotted seals haul out on ice floes, whereas during the summer months they can be found in the open ocean or hauled out on shore. Pup births peak in mid-March. The estimated population size for the Alaska stock of spotted seals is 59,000 animals. The population trend is unknown.

The enclosed map shows summer and fall concentration areas for spotted seals. In summer and early fall, spotted seals use coastal haul outs regularly, especially on barrier islands in several locations in the study area. Individual seals can make extensive foraging trips, as long as 1000 kilometers, from these haul out concentration areas.

As sea ice forms in the fall and winter, spotted seals and other ice-dependent animals retreat south back into the Bering Sea, typically crossing through the Bering Strait in November. During the winter spotted seals are found along the ice edge in the Bering Sea. In spring they prefer smaller ice floes along the southern margin of the sea ice and move to coastal habitats after the retreat of the sea ice.

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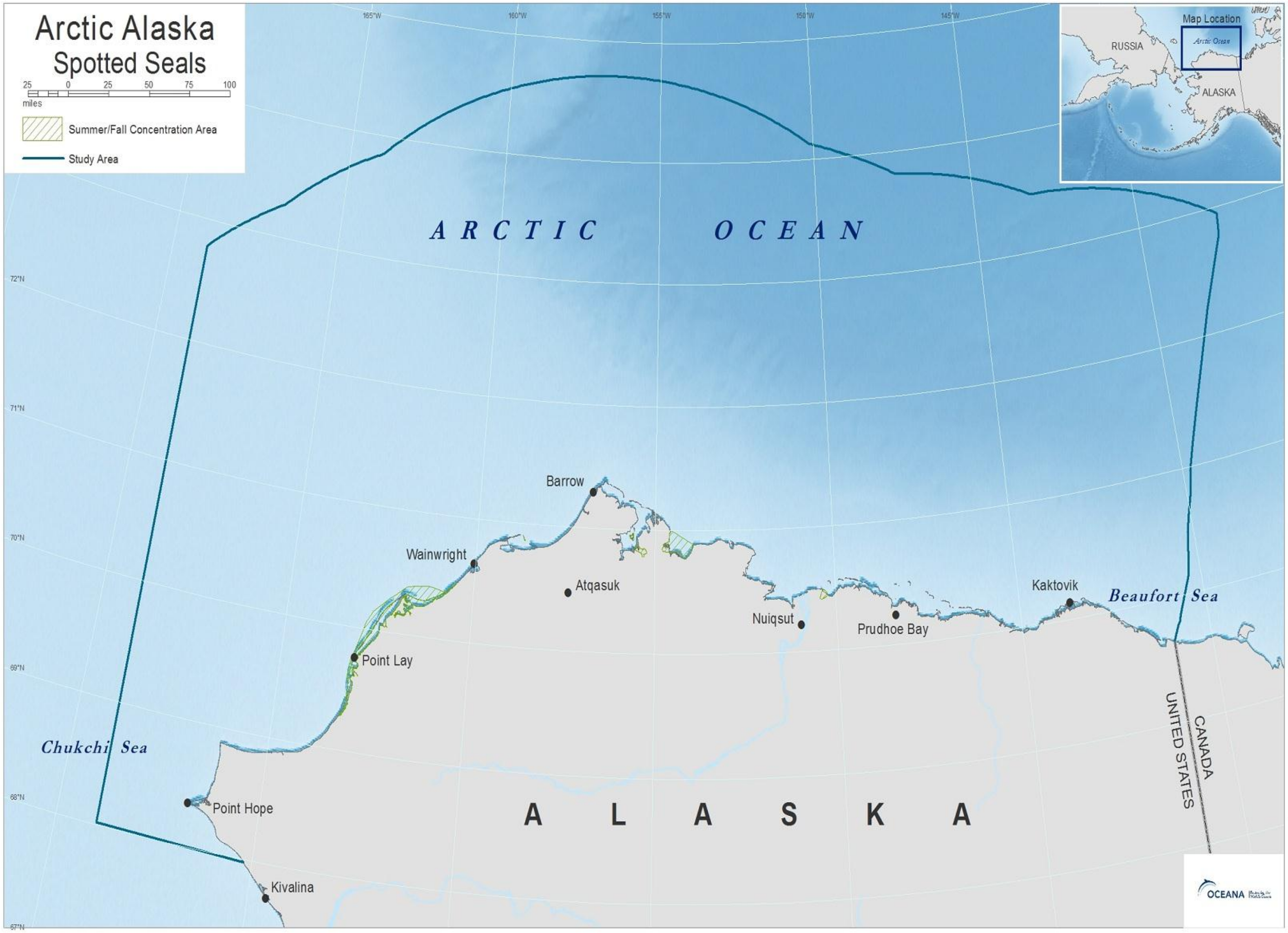

Arctic Alaska
Spotted Seals
miles
Summer/Fall Concentration Area
Study Area
Map Location
RUSSIA
ALASKA
ARCTIC OCEAN
Barrow
Wainwright
Atqasuk
Nuiqsut
Prudhoe Bay
Kaktovik
Beaufort Sea
Point Lay
Chukchi Sea
Point Hope
Kivalina
ALASKA
UNITED STATES
CANADA
OCEANA

SEASONAL MAPS

As described earlier, along with the maps showing seasonal concentration areas for each Arctic marine mammal species, we are also providing the following four maps that aggregate those concentration areas for all species during particular seasons. These maps provide another way of looking at the data about concentration areas. They also identify those overlapping seasonal concentration areas where, based on information available now, further study and extra caution is required to minimize any impact from offshore oil and gas activities.

As reflected on each species map, Arctic marine mammals move with the seasons. Sea ice cover, mating and calving behavior, availability of food for predators, protection for prey animals, availability of good haul out locations and a number of other factors contribute to the seasonal movements and concentration areas for individual species.

In the winter months, there are a number of marine mammal species that leave the Chukchi and Beaufort seas altogether, as they only are present to take advantage of the burst of summer productivity. A good example is the seasonal migration of gray whales, which come north to the Arctic to feed in the summer months and move south as far as Baja California to breed and calve in warmer waters in the winter.

There are some species, however, that remain in the winter—primarily polar bears and ringed seals—although there are overwintering bearded seals and there is documentation of gray whales overwintering as well. As reflected in the winter concentration areas map, the most important places for those marine mammals during the Arctic winter months are coastal areas and fast and nearshore pack ice along the Beaufort and Chukchi coasts.

As winter turns to spring, a host of species comes back to the region. A corridor of water opens up along the sea ice edge along the Chukchi coast consistently. This corridor is the pathway that tens of thousands of beluga whales, bowhead whales, seabirds and other animals use to return to the Beaufort and Chukchi seas. Hunters use this consistent and productive migration corridor extensively for subsistence. Impacts to this corridor could have important and far reaching consequence for the Beaufort and Chukchi large marine ecosystems.

As spring turns to summer, sea ice begins to retreat into the high Arctic, and the rest of the region's seasonal marine mammals return. Walrus, spotted seals, and gray whales begin to reenter the Chukchi and Beaufort seas, and the increase in activity as summer wears on stands in stark contrast to the leaner, harsher months of winter.

While marine mammals are found throughout the study area during the summer, the coastal region along the Chukchi Sea coast remains particularly important for marine mammals for feeding, haul outs and other uses. The enclosed map highlights some particular areas where large numbers and a wide variety of animals are concentrated during summer. For example, Beluga whales congregate in the area around Omalik lagoon, reaching their peak in late June. Kasegaluk Lagoon near Point Lay is very important for that community's beluga subsistence hunt, and also an abundant area for spotted seals and walrus haul outs.

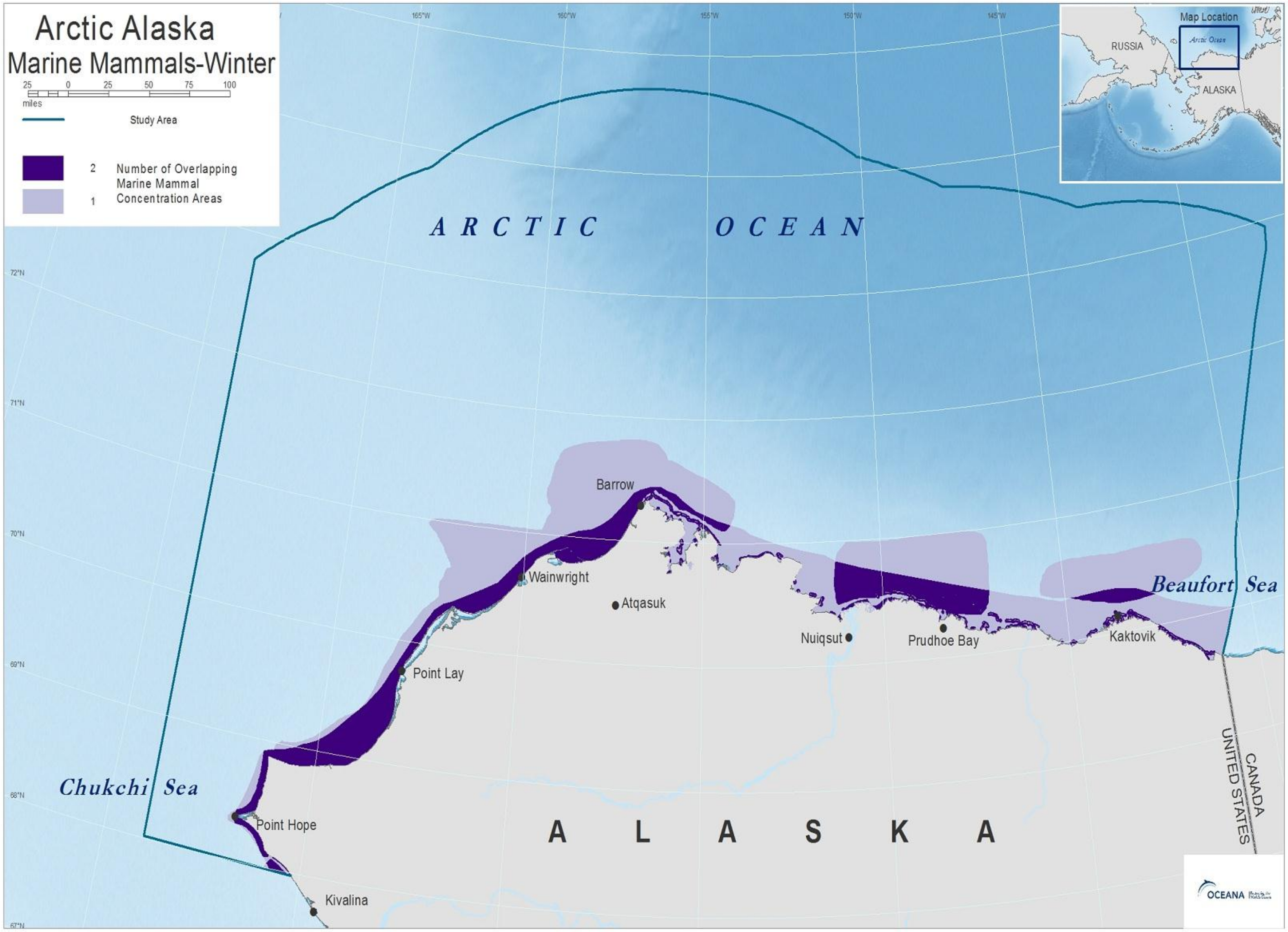
Whales also gather in the Barrow canyon and the Point Franklin regions to feed, with concentrations areas of belugas and gray whales. As the ice continues to recede throughout the summer, Hanna Shoal begins to become more important for marine mammals, with walrus in particular utilizing the region.

While summer is a busy time for marine mammals in the Arctic, the activity truly peaks as summer turns to fall. Sea ice reaches its annual minimum each September, and marine mammals are actively foraging in the open water, finding as much nutrition as possible to survive the long migration or lean Arctic winter ahead. Along with the frenzy of feeding, fall also is when gray whales and other species begin departing for warmer water farther south.

The fall map reflects this combination of feeding and the start of seasonal migrations. The Beaufort shelf and shelf break are important migration and feeding corridors for bowheads and belugas. The Barrow Canyon and Point Barrow area and areas south to Peard Bay and Point Franklin are hotspots for feeding of bowhead, beluga, and gray whales, as well as walrus.

In addition, Kasegaluk Lagoon and its barrier islands remain important with massive haul outs of walrus as well as being an important area for spotted seals hauling out. Hanna Shoal also continues to play a key role, with a number of concentration areas for foraging walruses, feeding and migrating bowhead whales, and foraging gray whales.

Clearly, even this limited analysis of only eight species shows not only many important areas to be protected, but also there is much more work to be done to understand the complex Arctic marine ecosystems. Without that understanding, we risk irreversible harm from decisions about moving forward with industrial activities. DOI must consider this and more information in its analyses. Given the proven risks and potential grave consequences of oil and gas activities in the Arctic there should not be Arctic lease sales in the 2012-2017 Five Year Plan. The region should be deferred from all oil and gas activities unless and until there is a plan in place that shows those activities can be conducted without harming the health of the ecosystem or opportunities for the subsistence way of life.


Arctic Alaska
Marine Mammals-Winter
25 0 25 50 75 100
miles
Study Area
2
1
Number of Overlapping Marine Mammal Concentration Areas
Map Location
RUSSIA
ALASKA
ARCTIC OCEAN
Barrow
Wainwright
Atqasuk
Nuiqsut
Prudhoe Bay
Kaktovik
Beaufort Sea
Point Lay
Chukchi Sea
Point Hope
Kivalina
ALASKA
UNITED STATES
CANADA
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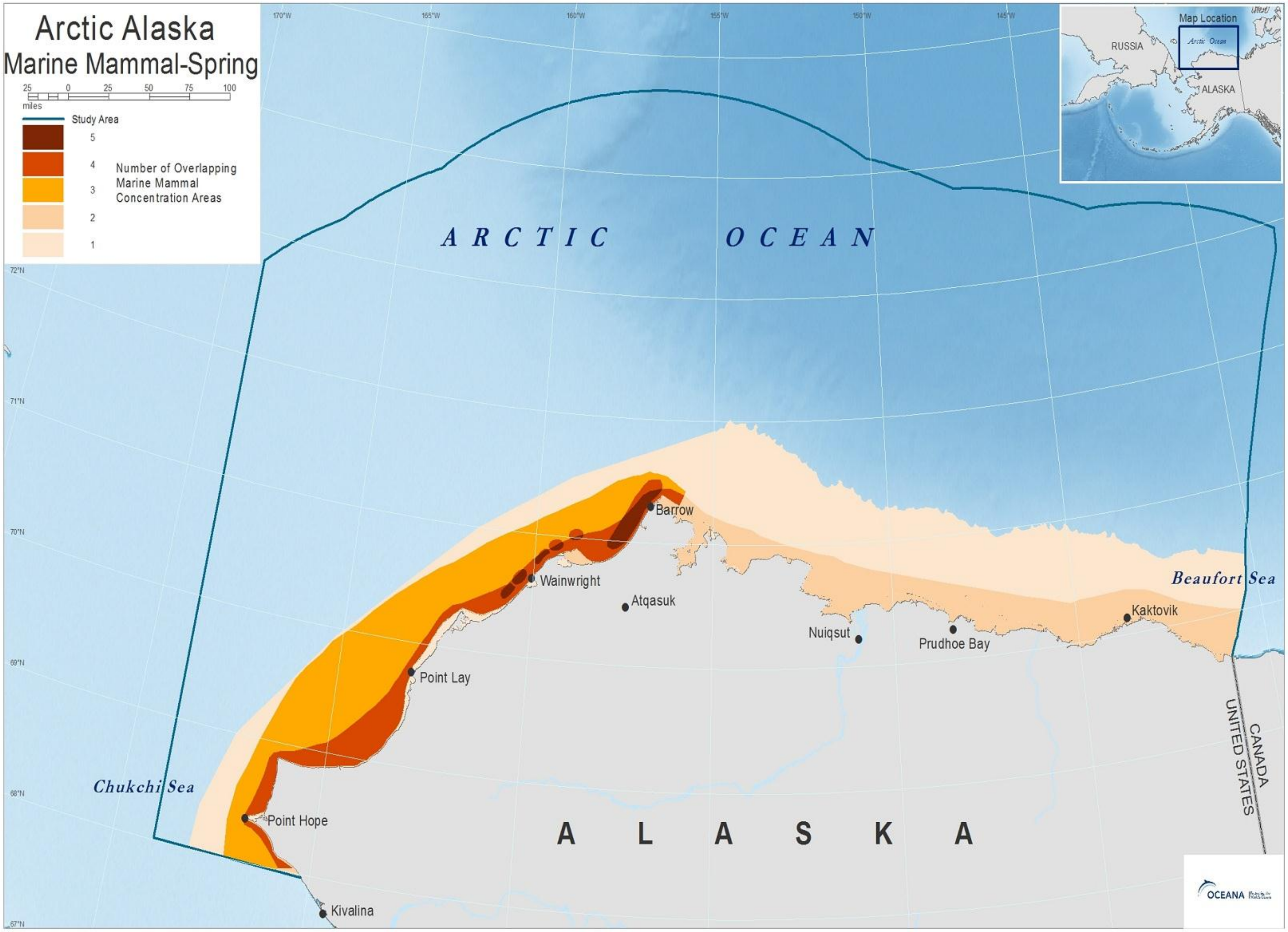
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Marine Mammal-Spring
miles
Study Area
Number of Overlapping Marine Mammal Concentration Areas
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4
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ARCTIC OCEAN
Chukchi Sea
Beaufort Sea
Barrow
Wainwright
Atqasuk
Nuiqsut
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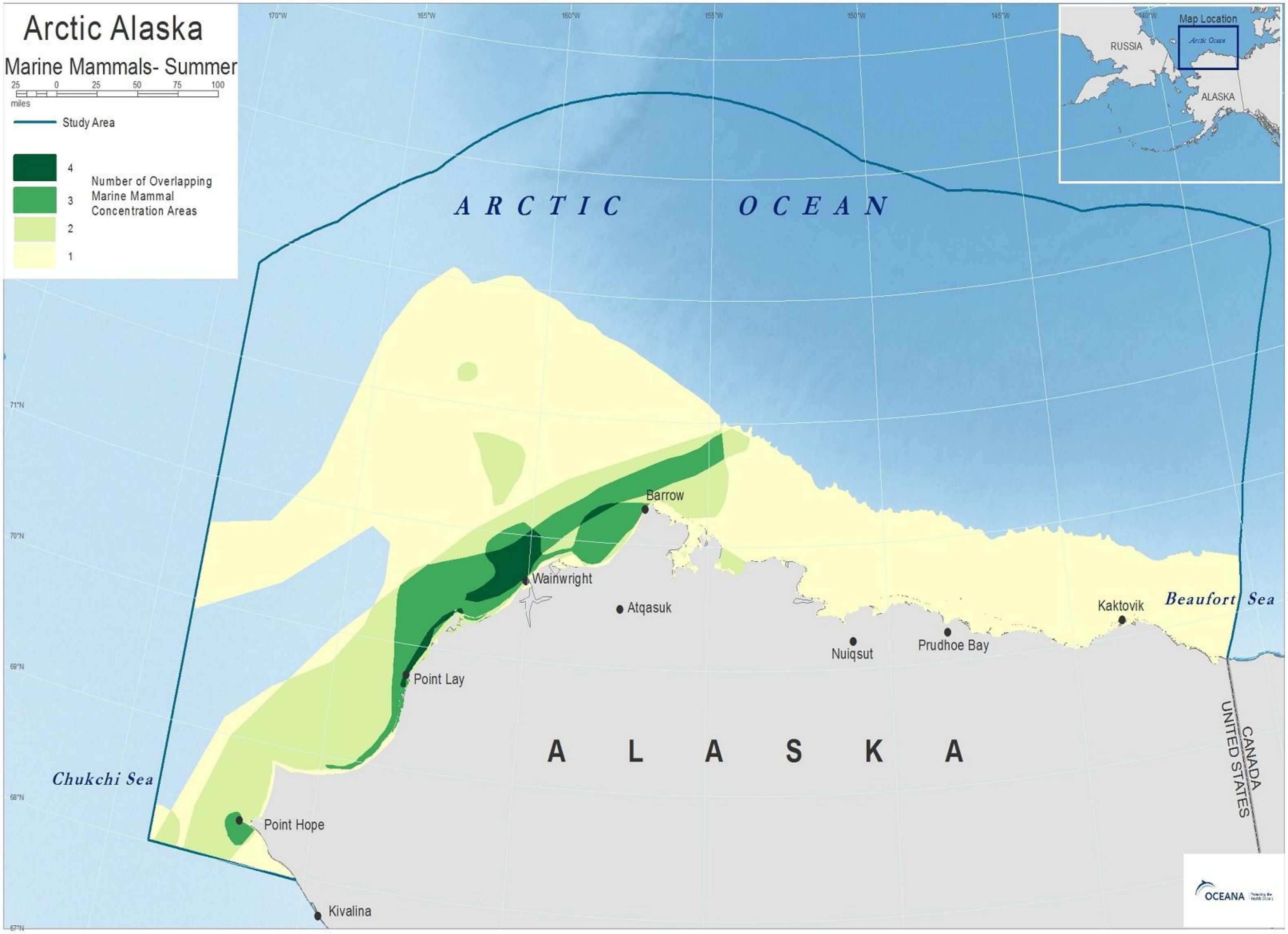
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Marine Mammals- Summer
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miles
Study Area
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Number of Overlapping Marine Mammal Concentration Areas
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Map Location
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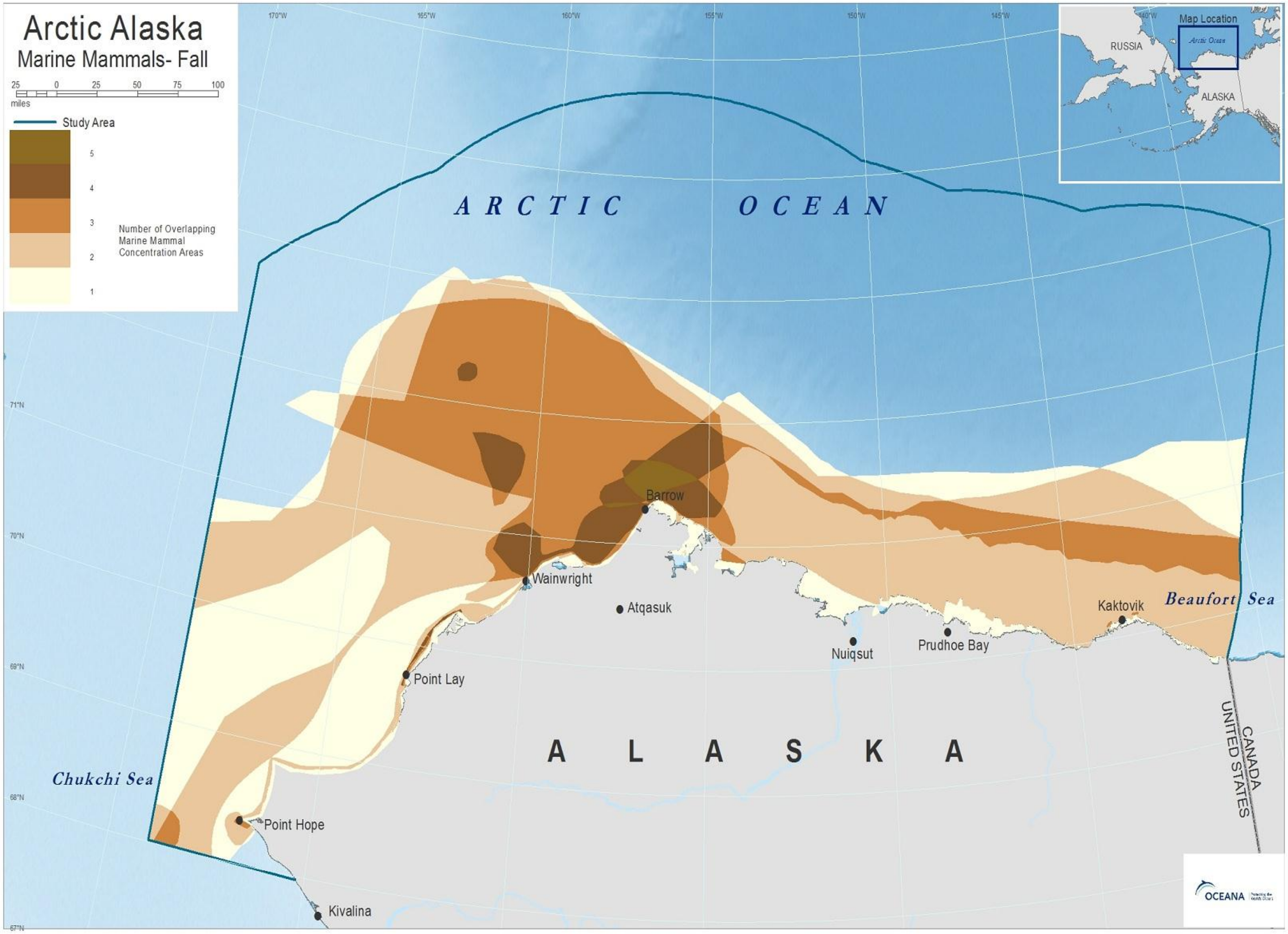
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IV. CONCLUSION

For the reasons explained above and others, BOEM should not schedule lease sales in the Chukchi Sea or Beaufort Sea planning areas in the 2012-17 Program. Rather than continuing the piecemeal approach to decision-making, BOEM should use the next five years to develop a vision for the Arctic region, commit to the science necessary to guide good decisions, and develop and demonstrate response technologies. With better information and planning, BOEM could move away from the ongoing controversy and litigation in the Arctic and toward a lasting solution that protects healthy ocean ecosystems and provides clean energy.

Sincerely,

Susan Murray
Senior Director, Pacific
Oceana

OCEANA, ALASKA'S BIG VILLAGE NETWORK,
CENTER FOR BIOLOGICAL DIVERSITY, CENTER FOR WATER ADVOCACY,
DEFENDERS OF WILDLIFE, GULF RESTORATION NETWORK,
OCEAN CONSERVATION RESEARCH,
SOUTHERN ENVIRONMENTAL LAW CENTER, SIERRA CLUB

January 9, 2011

Via Electronic Submission

James F. Bennett
Chief, Environmental Assessment Division
Bureau of Ocean Energy Management
381 Elden Street
Herndon, VA 20170

RE: Draft Programmatic Environmental Impact Statement for Proposed Outer Continental Shelf Oil and Gas Leasing Program for 2012-2017

Dear Mr. Bennett:

Oceana, Alaska's Big Village Network, Center for Biological Diversity, Center for Water Advocacy, Defenders of Wildlife, Gulf Restoration Network, Ocean Conservation Research, Southern Environmental Law Center and Sierra Club appreciate the opportunity to comment on the Draft Programmatic Environmental Impact Statement ("PEIS") for the Proposed Outer Continental Shelf Oil and Gas Leasing Program 2012-2017 ("5-Year Program"). The 5-Year Program provides a framework for offshore oil and gas exploration for the next five years. Given the 5-Year Program's significance, it is crucial that the environmental impacts of the Program be fully accounted for in the Final PEIS in order to clearly and fully understand and explain the potential environmental impacts of the Program to the public and stakeholders. Equally important is that all reasonable alternatives to the 5-Year Program be carefully analyzed and considered. The Final PEIS should assure that both of these ends are achieved.

To assist the Bureau of Ocean Energy Management ("BOEM") in this necessary effort, Oceana has identified numerous shortcomings and illegalities in the Draft PEIS that the agency must address as it prepares the Final PEIS. While this letter focuses on the Gulf of Mexico, many of the concerns apply nationwide, including in the Arctic. As such, this letter complements Arctic-focused comments submitted by Oceana and others.

Failing to correct the shortcomings and illegalities discussed in this letter would violate the National Environmental Policy Act ("NEPA") and the Outer Continental Shelf Lands Act ("OCSLA"). Perhaps more importantly, failing to correct these deficiencies would leave BOEM on a path that will, sooner or later, lead to another disastrous loss of life and harm to the environment. Said deficiencies are listed below and subsequently discussed at length.

I. The selection and analysis of alternatives in the Draft PEIS violates NEPA. The Final PEIS should fully analyze the following alternatives:
   - Excluding lease sales in the Gulf of Mexico in 2012 and 2013.
   - Excluding deepwater leases in the Gulf of Mexico.
   - Developing alternate/renewable energy sources to replace oil and gas from offshore drilling.

II. The Draft PEIS violates NEPA by failing to quantify greenhouse gas emissions resulting from the combustion of produced oil and gas and from all activities within the scope of the 5-Year Program.

III. The Draft PEIS violates NEPA by inaccurately portraying the relationship between the short- and long-term tradeoffs of the 5-Year Program. In particular, the Draft PEIS's discussion of that relationship fails to consider climate change and the impacts of oil spills, including catastrophic spills.

IV. The Draft PEIS violates NEPA by relying on an overly-simplistic oil spill risk analysis that underestimates the risk, and consequently the effects, of large and catastrophic spills.

V. The Draft PEIS violates NEPA by failing to sufficiently analyze potential cumulative impacts of the Proposed Action.
   - The discussion of cumulative impacts from climate change on marine mammals in the Gulf of Mexico fails to adequately account for incomplete or unavailable scientific information.
   - The method by which BOEM aggregates the effects of cumulative impacts is not discernible.
   - No consideration is given to potential synergistic and multiplicative effects between cumulative impacts.
   - The cumulative impacts analysis incorrectly claims that missing information pertaining to climate change impacts is not essential to a reasoned choice among alternatives.

VI. The Draft PEIS does not acknowledge the persistent shortcomings in the regulation and safety of offshore oil and gas drilling, which directly affect the risk of spills and other potential impacts to humans and the environment.

VII. The Draft PEIS does not adequately account for the impacts of the Deepwater Horizon spill or attempt to establish the appropriate environmental sensitivity analyses that show the comprehensive impacts of the 5-Year Program on Gulf of Mexico marine resources.

I. BACKGROUND

OCSLA stipulates that the timing and location of offshore leasing balance "the potential for environmental damage, the potential for the discovery of oil and gas, and the potential for adverse impact on the coastal zone" (Section 18.3). BOEM's recent actions, including the Draft PEIS and 5-Year Program, have failed to strike this balance. Indeed, generally speaking, the Draft PEIS and 5-Year Program are the most recent in a series of actions and documents that suggest that BOEM is more concerned with fostering offshore drilling than with sufficiently safeguarding the environment and communities.

In numerous comments previously submitted to BOEM during the decision-making processes for lease sales, exploration plans, and safety rulemakings, Oceana and other groups have highlighted many concerns regarding the impacts on wildlife and the environment in the Gulf of Mexico, the safety of offshore drilling, and the state of offshore regulation. Concerns we have repeatedly brought to BOEM's attention include:

- the need for an updated, quantitative, and rigorous spill risk analysis that goes beyond simple ratios based on historical, marginally relevant data and includes lessons learned from the Deepwater Horizon disaster;
- the need to delay drilling in the Gulf of Mexico until more stringent safety measures are implemented and more data on the short- and long-term effects of the Deepwater Horizon disaster on the ecosystem and coastal community are gathered;
- the need to consider climate change effects on the environmental baseline in the Gulf of Mexico and to fully account for greenhouse gas emissions from Outer Continental Shelf oil and gas activities;
- the significant shortcomings in the regulation of offshore drilling that increase the risk of shortcuts, violations and mismanagement, many of which were implicated in the Deepwater Horizon disaster and could lead to future oil spills;
- the failure of new post-Deepwater Horizon safety regulations to greatly improve the safety of offshore drilling; and
- the persistent inadequacies in the oil industry's oil spill response and cleanup capabilities, as demonstrated during the Deepwater Horizon disaster.

In past documents as well as in this Draft PEIS, BOEM has largely ignored these concerns, even though they are supported by copious amounts of data and impartial analysis.

The most recent analysis supporting many of the above conclusions is the National Academy of Engineering's ("NAE") and National Research Council's ("NRC") report on the Deepwater Horizon disaster, titled *Macondo Well-Deepwater Horizon Blowout: Lessons for Improving Offshore Drilling Safety*.[1] Notably, this report was requested by Secretary of the Interior Ken Salazar and is the result of more than a year and a half of intensive research, analysis and consultation with numerous industry organizations, companies and government agencies. The report arrived at a number of conclusions, many of which are highly alarming even though they are not new. Nonetheless, given the impartiality and prestige of the NAE and NRC, it is particularly worth noting the report's findings including the following direct quotes.

- "The committee's assessment of the available information on the capabilities and performance of the [blowout preventer] system at the Macondo well points to a number of deficiencies... that are indicative of *deficiencies in the design process*. Past studies suggest that the shortcomings *also may be present for BOP systems deployed for other deepwater drilling operations*." (54)
- "*BOP systems should be redesigned* to provide robust and reliable cutting, sealing, and separation capabilities for the drilling environment to which they are being applied..." (55)
- "Processes within the oil and gas industry to *assess adequately the integrated risks* associated with drilling a deepwater well, such as Macondo, *are currently lacking*." (77)

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[1] National Academy of Engineering, National Research Council. *Macondo Well – Deepwater Horizon Blowout: Lessons for Improving Offshore Drilling Safety*. 14 Dec. 2011.

- "[The offshore] industry's R&D efforts have been *focused disproportionately on exploration, drilling, and production technologies as opposed to safety*." (79)
- "Industry should *greatly expand R&D efforts* focused on improving the overall safety of offshore drilling..." (80)
- "For operations to proceed safely and efficiently in challenging environments, it is essential for private industry and [the Bureau of Safety and Environmental Enforcement ("BSEE")] to work in close collaboration in developing a list of *safety critical points and in establishing safe operating limits*" (89-90) that "*warrant explicit regulatory review and approval* [by BSEE and other regulators] before operations can proceed." (91)
- "[The Department of the Interior ("DOI")] should require BSEE to provide the Secretary of the Interior with a net assessment of the risks of future drilling activities so that such risks can be factored into decisions with regard to new leases.... the assessment should be a *formal probabilistic risk analysis* that evaluates risks associated with all operations having the potential for significant harm to individuals, environmental damage, or economic loss." (94)

Many of the conclusions of the NAE and NRC report echo those of the National Commission on the BP Deepwater Horizon Oil Spill[2], the federal Joint Investigation Team[3] and previous complaints lodged by Oceana and other groups[4], underscoring that the fundamental flaws in the regulation and safety of offshore drilling are well-established and well-known.

BOEM cannot simply continue to sweep these concerns under the rug in the face of great uncertainty, and proceed with leasing and permitting as if nothing is amiss. The NRC and NAE report requested by Secretary Salazar demonstrates that such a course of action would be poorly-informed and could lead to disastrous consequences. The 5-Year Program and Draft PEIS present a perfect opportunity for BOEM to conduct a considered analysis and to reestablish the balance of environmental protection and oil and gas production required by law.

II. THE SELECTION AND ANALYSIS OF ALTERNATIVES IN THE DRAFT PEIS VIOLATES NEPA

The Draft PEIS violates NEPA by failing to consider three reasonable alternatives that would greatly alter the environmental impact and cost-benefit balance of the 5-Year Program. One of NEPA's fundamental requirements is that the agency "study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources" (42 U.S.C. § 4332(2)(E)). Indeed, the discussion of alternatives "is the heart of the [EIS]" (40 C.F.R. § 1502.14), as one of the main purposes of an EIS is to "rigorously explore and objectively evaluate all reasonable alternatives" to the Proposed Action (40 C.F.R. § 1502.14(a)). Only by doing so can the EIS "guarantee that agency decision-makers have before them and take into proper account all possible approaches to a particular project (including total

[2] National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling. *Deep Water: The Gulf Oil Disaster and the Future of Offshore Drilling. Report to the President.* 11 Jan. 2011.
[3] Joint Investigation Team. "Volume II: Report regarding the causes of the April 20, 2010 Macondo well blowout." *Report of Investigation*. 14 Sept. 2011.
[4] E.g., see comments jointly filed by Center for Biological Diversity, Defenders of Wildlife, Oceana, and the Southern Environmental Law Center regarding the Draft Supplementary Environmental Impact Statement for Central Planning Area Lease Sale 216/222, submitted via email on August 16, 2011.

abandonment of the project) which would alter the environmental impact and the cost-benefit balance."[5]

All three reasonable alternatives discussed below would significantly alter the environmental impact and cost-benefit analysis of the 5-Year Program. BOEM does not provide valid reasons for failing to consider these alternatives in the Draft PEIS, as detailed below. Thus, the Final PEIS, in order to comply with NEPA, must fully consider and analyze these three alternatives.

The Draft PEIS Violates NEPA by Failing to Consider an Alternative that Would Forego Lease Sales in the Gulf of Mexico in 2012 and 2013

The Draft PEIS violates NEPA and OCSLA by failing to consider an alternative that would forego any lease sales in the Gulf of Mexico Planning Areas during 2012 and 2013 so that additional data on the impacts of the Deepwater Horizon spill can be gathered. As previously stated, the alternatives analysis is integral to an EIS and should ensure that decision-makers can consider "all possible approaches to a particular project (including total abandonment of the project) which would alter the environmental impact and the cost-benefit balance."[6] The alternative proposed here is reasonable and is crucial to a reasoned choice among alternatives. In fact, by not considering the alternative, the Draft PEIS is less able to achieve one of its stated purposes.

While many large offshore oil spills have occurred and continue to occur,[7] the Deepwater Horizon spill was unique in that it was much larger than previous spills and occurred in deep water. The impacts of the Deepwater Horizon disaster, though, are still not fully known. As the Draft PEIS acknowledges, great uncertainty still exists regarding what significant adverse effects the Deepwater Horizon spill had on resources in the Gulf of Mexico (1-8). Partly as a result of this incomplete information, the extent to which oil spills affect Gulf of Mexico resources is currently unknown. The Draft PEIS acknowledges this uncertainty, noting, for instance, that impacts from oil spills on marine mammals (4-590) and birds (4-595) would be small to large, depending on a number of variables, and furthermore that oil spills "could represent a major component of the overall exposure of marine and coastal birds in the Gulf of Mexico OCS planning areas" (4-593).

Having more information on the effects of the Deepwater Horizon spill would therefore allow for a more informed choice among alternatives, as it would shed light onto the economic and environmental effects of oil spills, which constitute a large portion of the impacts from offshore oil and gas activities (Draft PEIS 4-593). Eliminating lease sales in the Gulf of Mexico during 2012 and 2013 would allow time for information on the effects of the Deepwater Horizon disaster to be collected and produce a better analysis of potential damage to the environment from the proposed activities. Such an alternative is exactly the sort that should be considered according to NEPA, as it is reasonable (40 C.F.R. § 1502.14(a)) and presents a different environmental impact and cost-benefit balance. Thus, by not considering the alternative in question, the Draft PEIS violates NEPA.

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[5] *Alaska Wilderness Recreation & Tourism Ass'n v. Morrison*, 67 F.3d 723, 729 (9th Cir. 1995) (quoting *Bob Marshall Alliance v. Hodel*, 852 F.2d 1223, 1228 (9th Cir. 1988)); *see also California v. Block*, 690 F.2d 753, 767 (9th Cir. 1982).
[6] Id.
[7] E.g., Shell's oil spill offshore Nigeria on December 20, 2011, Chevron's oil spill offshore Brazil on November 7, 2011, and ConocoPhillip's oil spill offshore China in June, 2011.

By not considering the alternative in question, the Draft PEIS also lessens its ability to achieve one of its stated purposes. The Draft PEIS "sets forth alternatives for the Secretary to consider and analyzes issues of programmatic concern" (1-8). According to the Draft PEIS, "risk of potentially severe consequences of oil spills, especially the risk and consequence of low-probability, large volume spills [like the Deepwater Horizon disaster], is an issue of programmatic concern" (Draft PEIS 4-65). The Deepwater Horizon spill is the first opportunity to understand and analyze the impacts of catastrophic spills, but great uncertainty surrounds the impacts of the Deepwater Horizon spill at this time. As a result, only an incomplete analysis of the risk of potentially severe consequences of future catastrophic spills is possible at present. However, in time, more will be known and less uncertainty will exist. By not considering an alternative that would allow for this issue of programmatic concern to be more fully analyzed and discussed, the Draft PEIS hinders its own goal.

Not only would the alternative better achieve one of the stated purposes of the Draft PEIS, it would also appropriately strike the balance mandated by OCSLA and do so in a more appropriate manner than the Proposed Action, as it would allow for a more accurate analysis of potential environmental damage and not hinder oil and gas discovery. OCSLA stipulates that the timing and location of lease sales should "balance... the potential for environmental damage, the potential for the discovery of oil and gas, and the potential for adverse impact on the coastal zone" (Sec. 18.3). If lease sales in the Gulf of Mexico were cancelled for 2012 and 2013, oil and gas companies could still explore for oil and gas on thousands of preexisting leases, so oil and gas discovery would not be hindered by the alternative. Oil and gas companies currently hold 4,251 leases in the Gulf of Mexico that are inactive, meaning they have no approved exploration or development plan, roughly double the number of active leases in the Gulf.[8] These inactive leases, according to the Department of the Interior, contain approximately 70% of the Undiscovered Technically Recoverable Resources in the Gulf of Mexico, totaling 11.6 billion barrels of oil and 59.2 tcf of natural gas.[9]

BOEM does state that it considered including a similar alternative - namely, delaying sales until further evaluation of oil spill response and drilling safety is completed (hereafter referred to as the "oil spill response alternative"; Draft PEIS 2-10) - to the one proposed here. The alternatives are similar in that both would delay leasing until additional information is gathered. However, BOEM's explanation for why it did not fully consider and analyze the oil spill response alternative misses the mark.

For one, the Draft PEIS states, "[w]aiting until further evaluation is completed would delay the Program beyond the 5-year revision requirement specified in Section 18 of OCSLA" (2-10). This is not a valid reason for not considering an alternative. BOEM has had a reasonable amount of time to complete the Draft PEIS and to consider all relevant alternatives. BOEM cannot use the excuse that it has insufficient time to avoid the need to consider an alternative. More importantly, though, considering the alternative proposed here would not necessarily delay the 5-Year Program, as the creation of the 5-Year Program itself would not need to be delayed until a full evaluation of the effects of the Deepwater Horizon disaster is completed. Rather, the 5-Year Program would need to analyze and consider an alternative that would delay lease sales in the Gulf of Mexico for 2012 and 2013, until additional information on the Deepwater Horizon impacts is gathered.

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[8] U.S. Department of the Interior. *Oil and Gas Lease Utilization – Onshore and Offshore. Report to the President*. Mar. 2011. Pg. 4.
[9] Id.

The other reason BOEM gives for not considering the oil spill response alternative is that the Secretary of the Interior can delay or cancel any lease sale in the future, for any reason, such as a need for further evaluation of spill response issues (Draft PEIS 2-10). Although BOEM uses this rationale throughout the Draft PEIS to avoid analyzing various alternatives and data, it is a specious argument. The point of an EIS is to analyze potential environmental and economic impacts of a proposed action and its reasonable alternatives. Here, delaying Gulf of Mexico lease sales is a reasonable alternative, and BOEM is obligated to analyze its environmental impacts. BOEM's ability to cancel scheduled lease sales does not obviate, and indeed is completely irrelevant to, its duty to conduct this environmental analysis. And while BOEM could analyze the impacts of cancelling individual lease sales in subsequent EISs at the lease sale stage, that in no way negates BOEM's duty to analyze, in this EIS, the environmental impacts of a programmatic alternative in which Gulf of Mexico lease sales are not scheduled at all in 2012 and 2013.

An alternative that would exclude lease sales in the Gulf of Mexico for 2012 and 2013 satisfies the OCSLA mandate that the 5-Year Program balance environmental protection and oil and gas development better than the Proposed Action. Furthermore, in order to be internally consistent and comply with NEPA, the Final PEIS must consider such an alternative. Finally, the reasons given by the Draft PEIS for not considering a similar alternative are not viable. BOEM should include and analyze an alternative that excludes lease sales in the Gulf of Mexico Planning Areas for 2012 and 2013 in the Final PEIS.

The Rationale for Not Considering a "No Deepwater Leases" Alternative in the Draft PEIS is Flawed

The Draft PEIS rejects the need to consider an alternative in which oil and gas leasing in deepwater areas of the Western and Central Gulf of Mexico Planning Areas would be deferred. Such an alternative is reasonable and appropriate per NEPA and OCSLA, which mandates a balance between the potential for environmental damage and the discovery of oil and gas (Sec. 18.3). The alternative would afford better protection to the environment by prohibiting new deepwater leases, as deepwater drilling is riskier than shallow water as demonstrated below. Furthermore, it would not greatly hinder oil and gas discovery and production, as discovery and production could still continue on the many existing but inactive deepwater leases (see above) and in shallow water.

Not only is the alternative reasonable and appropriate, BOEM's rationale for rejecting it is flawed in two ways. First, the Draft PEIS essentially presupposes that the impacts of this alternative on oil and gas production outweigh its potential environmental benefits. This presupposition violates NEPA by circumventing the intent and purpose of an EIS, which requires a detailed analysis of the potential environmental benefits of an action before concluding that those benefits are outstripped by other factors. Second, the Draft PEIS incorrectly identifies water depth "as just one of many risk factors" to be considered in leasing decisions (2-12), when in fact water depth is a general proxy for drilling risk. On account of these two flaws and the fact that the alternative is reasonable and appropriate, the Final PEIS must incorporate a formal analysis of the "no deepwater leases" alternative in order to comply with NEPA.

In regard to the first flaw, the Draft PEIS refutes the need to consider the alternative in question by stating:

> to exclude all deepwater areas in the GOM from potential oil and gas exploration and development would not be reasonable in light of the purpose and need for the oil and gas leasing program, which is to help meet the Nation's energy needs by developing oil and gas resources in a manner consistent with environmental protection and the laws and policies of affected States. (2-12)

In other words, BOEM claims that deferring deepwater leasing would not be reasonable because allowing deepwater leasing strikes the right balance between potential benefits (specifically, helping to meet the Nation's need for oil and gas) and adverse impacts, such as environmental damage to the ocean and coastal zone.

How the Draft PEIS arrives at this conclusion – that allowing deepwater leasing "ensure[s] a proper balance between oil and gas production and possible environmental impacts" (2-13) – is not at all clear. Indeed, no analysis in support of this statement is conducted; it is simply stated as a self-evident truth. That approach is exactly backward. The purpose of an EIS is to evaluate the "comparative merits" of the Proposed Action and reasonable alternatives (40 C.F.R. § 1502.14) and *then* determine which action is most appropriate in light of the environmental impacts of each. In the Draft PEIS, however, BOEM simply *presumes* that maximum oil and gas production – including deepwater leases – is more appropriate than an option that excludes deepwater leases. BOEM's approach ignores the purpose of NEPA review by rejecting out of hand a reasonable alternative that would "avoid or minimize" the adverse environmental impacts of the 5-Year Program (40 C.F.R. § 1502.1). In order to comply with NEPA, BOEM should therefore formally consider the alternative in question within the Final PEIS.

With regard to the second flaw, the Draft PEIS "identifies water depth as just one of many risk factors that should be considered with other factors when making specific leasing decisions" (2-12). In other words, the Draft PEIS states that water depth is a risk factor, but is no more important than other risk factors. BOEM does not explain why considering an alternative that takes into account water depth is unreasonable, *even if* it is not the only relevant risk factor. Such an alternative is, in fact, reasonable and BOEM should analyze it in the Final PEIS. Moreover, while it is true that there are many risk factors in offshore drilling, all of which should be accounted for when making leasing decisions, it is not true that water depth in the Gulf of Mexico is "just one of many risk factors" (Draft PEIS 2-12). Rather, as noted below, water depth positively correlates with many other risk factors in the Gulf of Mexico. As a result, it can serve as a general proxy for drilling risk and so should be accorded greater importance among risk factors by BOEM. In this light, an alternative that defers deepwater leasing is reasonable and greatly alters the cost-benefit analysis of environmental and economic impacts, and so should be considered by the Draft PEIS per NEPA.

The Draft PEIS lists many risk factors that affect catastrophic discharge events in Table 4.3.4-1. In addition to water depth, the listed risk factors are geology; well design and integrity; loss of well control prevention and intervention; human error; containment capability; response capability; scale and expansion; geography; and oil type, weathering and fate. As is demonstrated below, of these nine additional risk factors, the first six all correlate with water depth. In other words, the risk of a catastrophic discharge event associated with these six factors is greater in deepwater and ultra-deepwater environments. The correlation of each risk factor with water depth is discussed in turn below.

Geology varies between areas in the Gulf of Mexico, but geologic risk in general increases with increasing drilling depth (i.e., water depth) (Draft PEIS 4-68). Geologic risk also increases when drilling in "frontier areas" (id. 4-68), which includes deepwater and ultra-deepwater areas. Furthermore, deepwater reservoirs in the Gulf of Mexico have many challenging geologic characteristics, e.g. narrow margins in pore pressure and fracture gradient (id. 4-70) and high-pressure/high-temperature conditions (id. 4-70).

Well design and integrity risk also positively correlates with water depth. Geologic factors like high-pressure/high-temperature conditions and narrow margins in pore pressure and fracture gradient "represent key concerns for the potential influence geology exerts on wellbore integrity" (Draft PEIS 4-70). Thus, geologic risk positively correlates with well integrity risk; as geologic risk increases, well integrity becomes harder to maintain and so the risk of losing well integrity increases. Since geologic risk increases with water depth, so too then does well integrity risk. Indeed, the Draft PEIS states that drilling deepwater and ultra-deepwater wells challenges drilling engineers, as more casing strings are necessary, which makes it harder to achieve good cement isolation (4-73). Furthermore, water depth increases the complexity of operations (Draft PEIS 4-68, Table 4.3.4-1), and greater complexity "may present more opportunity for mechanical breakdown and accidents" (id. 4-71).

Loss of well control prevention and intervention risk, or the potential inability of an operator to prevent or intervene in the case of loss of well control, is also greater at increased water depths. In deepwater and ultra-deepwater environments, intervention operations after a blowout must be conducted remotely, e.g. by using a remotely operated vehicle ("ROV"; Draft PEIS 4-75). ROVs and other remote systems, though, can fail, increasing the failure risk of intervention operations. High pressure blowouts, which are generated by high-pressure reservoir conditions such as those in deepwater environments (see above), can render blowout preventers ("BOPs") not functional, thereby eliminating the last line of defense against a loss of well control. And if a blowout does occur, the need for remote operations makes subsea efforts to stop a blowout more difficult, as the Deepwater Horizon disaster demonstrated.

Human error risk also positively correlates with water depth. Water depth increases the complexity of operations (Draft PEIS 4-68, Table 4.3.4-1), and greater complexity increases the number of routine operations and incidence of unusual operations (Draft PEIS 4-71). More routine and especially unusual operations increase the risk that human error can occur.

Containment capability also varies with water depth, as well containment operations are harder to conduct in deepwater and ultra-deepwater environments, i.e. frontier areas. Containment caps have not yet been built to withstand water depths beyond 10,000 feet and pressures above 15,000 psi, so containment is not an option for ultra-deepwater operations taking place at water depths or pressures greater than these values. More importantly, containment systems like capping stacks are more difficult to install in deepwater, ultra-deepwater and other frontier areas due to inhospitable environments and the need for remote operations.

Response capability also positively correlates with water depth. The Deepwater Horizon disaster was the first deepwater blowout and revealed significant differences in response capability between blowouts in shallow and deepwater. Because of the depth of the Macondo well, a large portion of the oil and gas that escaped from the well formed subsea plumes and/or dispersed into the water column, rather than rising to the surface where it could be recovered or would aerosolize.[10] Thus, the capability to respond to the spill through oil removal was undercut because the well was located in deepwater.

As demonstrated above, six of the nine non-water depth risk factors for catastrophic discharge events positively correlate with water depth. Thus, water depth is not "just one of many risk factors" (2-12) as the Draft PEIS states, but rather is more broadly representative of the risk of offshore drilling. Certainly water depth is not the only risk factor that should be considered in making leasing decisions. But the link between water depth and additional risk factors for catastrophic discharges demonstrates that environmental impacts will be significantly different in deepwater leasing, and underscores the need to consider an alternative in which deepwater leasing would be deferred. Consequently, BOEM should consider the alternative in its Final PEIS.

The Rationale for Not Considering a "Develop Alternate/Renewable Energy Sources" Alternative in the Draft PEIS is Flawed

In the Draft PEIS, BOEM incorrectly dismisses the need to analyze an alternative where alternate/renewable energy sources would be developed in lieu of oil and gas leasing on the Outer Continental Shelf. Such an alternative is reasonable and meets the objectives of the Proposed Action, and the rationales BOEM offers for dismissing this alternative are flawed. Consequently, the Draft PEIS fails to "rigorously explore and objectively evaluate all reasonable alternatives" to the Proposed Action (40 C.F.R. § 1502.14(a)) and so violates NEPA. BOEM should formally and fully analyze this alternative in its Final PEIS.

NEPA requires BOEM to consider a range of "reasonable" alternatives to the Proposed Action, meaning those that are "*practical or feasible* from the technical and economic standpoint"[11] and that will meet the objectives of the proposed federal action. "[A]n alternative is properly excluded from consideration in an environmental impact statement only if it would be reasonable for the agency to conclude that the alternative does not 'bring about the ends of the federal action.'"[12] The option of developing alternate/renewable energy sources appears to meet the criteria for consideration, and not exclusion. The purpose and need for the 5-Year Program, according to BOEM, is to "best meet national energy needs for the 5-year period following its approval . . . by balancing the potential for adverse environmental and societal impacts with the beneficial impacts of the discovery and development of oil and gas" (1-3 to 1-5). Developing alternate/renewable energy sources in lieu of some or all offshore oil and gas could bring about that objective because alternate/renewable energy sources could meet national energy needs while striking a balance that is more environmentally

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[10] E.g., Reddy, C.M., J.S. Arey, J.S. Seewald, S.P. Sylva, K.L. Lemkau, R.K. Nelson, C.A. Carmichael, C.P. McIntyre, J. Fenwick, G.T. Ventura, B.A.S. Van Mooy, and R. Camilli. (2011). Composition and fate of gas and oil released to the water column during the *Deepwater Horizon* oil spill. *Proc. Natl. Acad. Sci* Early Edition.

[11] Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations, 46 Fed. Reg. 18026, 18027 (Mar. 23, 1981).

[12] *City of Alexandria v. Slater*, 198 F.3d 862, 867 (D.C. Cir. 1999) (quoting *Citizens Against Burlington, Inc. v Busey*, 938 F.2d 190, 195 (D.C. Cir. 1991).

protective than BOEM's preferred alternative. It would afford much greater protection to the environment by protecting offshore and coastal areas from spills, acoustic disturbances and other impacts and by reducing the nation's greenhouse gas emissions. Moreover, replacement of offshore oil and gas with alternate/renewable energy sources appears to be economically and technically feasible.[13] Many alternate/renewable energy technologies already are technologically proven, commercially available and scalable. In fact, alternate/renewable energy sources are already a growing focus of energy markets and will play an increasingly-large role in the world's energy supply in the coming decades.

The Draft PEIS offers two rationales for failing to fully consider an alternate/renewable energy sources alternative. First, the Draft PEIS states that "such sources could not replace the energy supplied by oil and gas from OCS sources" (2-10). Second, the Draft PEIS explains that it has already indirectly analyzed the environmental impacts of this alternative because the impacts would be the same as those of the No Action Alternative (2-10). Neither of these rationales is legally sufficient to exclude a reasonable, feasible alternative capable of meeting the 5-Year Program's stated purpose and need. Moreover, even if those rationales were legally sufficient, as detailed below, they are factually incorrect.

With regard to the first claim, Oceana's own analysis demonstrates that alternate/renewable energy sources can, in fact, replace oil and gas from the OCS by 2020.[14] We show that this goal can be achieved with reasonable action and without significant subsidies or other government support. Other reports have demonstrated that similar reductions in oil consumption are achievable in the near future.[15] Even so, for the Draft PEIS, alternate/renewable energy sources must only replace the oil and gas developed as a result of the 5-Year Program, which is a much lower bar.

To its credit, the Draft PEIS discusses alternate/renewable energy sources that could replace oil and gas in Section 4.5.7.1. However, this discussion has one critical flaw that undermines the entire discussion: it ignores the effect that increased research and development ("R&D") and deployment of alternate/renewable energy sources, spurred by a reduced emphasis on oil and gas production, could have on the future ability of these sources to supplant oil and gas.

Take, for instance, the Draft PEIS's discussion of the future potential of electric vehicles ("EVs") and plug-in hybrid electric vehicles ("PHEVs") to reduce the nation's oil consumption (4-479). The Draft PEIS cites a 2010 National Research Council ("NRC") report to estimate the number of PHEVs and EVs that could be on the road in the near future and by how much they could reduce oil consumption. But the NRC report does not consider what effect augmented R&D or deployment would have on potential market penetration of EVs and PHEVs, despite highlighting the crucial role

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[13] Craig, M.T., and S. Mahan. Breaking the Habit: Eliminating our Dependence on Oil from the Gulf of Mexico by 2020, the Persian Gulf by 2023, and All Other Nations by 2033. *Oceana*. Apr. 2011. http://na.oceana.org/en/news-media/publications/reports/breaking-the-habit-eliminating-our-dependence-on-oil-from-the-gulf-of-mexico-by-2020-the-persian.

[14] Id.

[15] Dutzik, T., E. Ridlington, R. Kerth, T. Madsen, and D. Gatti. Getting Off Oil: A 50-State Roadmap for Curbing our Dependence on Petroleum. *Environment America*. July 2011. http://www.environmentamerica.org/home/reports/report-archives/global-warming-solutions/global-warming-solutions/getting-off-oil-a-50-state-roadmap-for-curbing-our-dependence-on-petroleum.

R&D plays in improving battery technology and driving down electric vehicle costs.[16] An alternative under which alternate/renewable energy sources are emphasized in place of oil and gas would facilitate R&D and deployment of alternate/renewable energy sources, as it would send a clear market signal to investors that our nation is committed to developing alternate/renewable energy sources rather than oil and gas. Market certainty is a key factor in investment decisions, so signaling a commitment to alternate/renewable energy sources would likely increase investment in those sources.[17] Increased investment, in turn, would boost R&D and deployment of those sources.

By not considering the potential for augmented R&D and deployment of oil and gas alternatives in an alternate/renewable energy sources alternative, the Draft PEIS fails to adequately characterize the potential for those alternatives to displace the oil and gas that would be produced under the Proposed Action. This shortcoming does not apply only to the Draft PEIS's discussion of electric vehicles, but to its discussion of oil and gas alternatives as a whole. Thus, the Draft PEIS fails to properly substantiate its claim that alternate/renewable energy sources could not replace oil and gas that would be produced under the Proposed Action (2-10). To do so would require a formal analysis of an alternate/renewable energy sources alternative, which should be included in the Final PEIS.

In regards to the second claim, the alternative in question would have markedly different impacts than the No Action Alternative because it would augment the R&D and deployment of alternate/renewable energy sources. Under the No Action Alternative, alternate/renewable energy sources would be developed as they would be if oil and gas were developed, i.e. under the Proposed Action. As described above, though, expedited development and deployment of alternate/renewable energy sources would occur under the proposed alternative compared to the No Action Alternative. Consequently, alternate/renewable energy sources would replace more oil and gas and eliminate the need for more oil and gas exploration and development. Thus, the Draft PEIS's treatment of the alternate/renewable energy sources alternative as having similar environmental impacts as the No Action Alternative is inaccurate.

The two reasons given by the Draft PEIS for not considering an alternate/renewable energy sources alternative are invalid. Furthermore, the alternative merits consideration under NEPA, as it is reasonable and would greatly alter the environmental impact and cost-benefit balance of the Proposed Action. [18] Thus, the Final PEIS must consider the alternative in order to comply with NEPA.

III. THE DRAFT PEIS VIOLATES NEPA BY FAILING TO QUANTIFY GREENHOUSE GAS EMISSIONS RESULTING FROM THE COMBUSTION OF PRODUCED OIL AND GAS

The Draft PEIS violates NEPA by failing to quantify greenhouse gas ("GHG") emissions that would result from the combustion of oil and gas developed as a result of the Proposed Action. The 5-Year Program leads to the generation of GHG emissions directly, via activities related to exploration,

[16] National Research Council. *Transitions to Alternative Transportation Technologies – Plug-in Hybrid Electric Vehicles*. Summary. 2010. Pg. 4.

[17] Freed, J., E. Horwitz, and N. Cunningham. "A Clean Energy Standard: Getting the United States Back into the Clean Energy Race." *Third Way*. Mar. 2011. http://content.thirdway.org/publications/382/Third_Way_Policy_Memo_-_A_Clean_Energy_Standard-Getting_the_United_States_Back_into_the_Clean_Energy_Race.pdf

[18] *Alaska Wilderness Recreation & Tourism Ass'n v. Morrison*, 67 F.3d 723, 729 (9th Cir. 1995) (quoting *Bob Marshall Alliance v. Hodel*, 852 F.2d 1223, 1228 (9th Cir. 1988)); *see also California v. Block*, 690 F.2d 753, 767 (9th Cir. 1982).

development, transportation of product and product processing, as well as indirectly, via the combustion of the oil and gas extracted as a result of the Program. Nonetheless, the Draft PEIS fails to quantify GHGs, which contribute to climate change,[19] from the combustion of oil and gas and from all routine activities within the scope of the Draft PEIS. Both omissions violate NEPA, and the rationale for the omissions given by the Draft PEIS is flawed.

NEPA Requires the Draft PEIS to Fully Account for Greenhouse Gas Emissions Resulting from the 5-Year Program

Because climate change could have significant impacts on the oceans and coastal environments of the United States, the omission of a full GHG accounting prevents the Draft PEIS from "providing a full and fair discussion of environmental impacts" (40 C.F.R. § 1502.1). The Draft PEIS itself notes that many impacts associated with climate change have already been observed in U.S. coastal regions, including "changing air and water temperatures, rising sea levels, more intense storms, ocean acidification, coastal erosion, sea ice loss, declining coral reef conditions, and loss of critical habitats such as estuaries, wetlands, barrier island, and mangroves" (3-18). The Draft PEIS further notes that climate change could impact coastal wetlands (4-553), benthic and pelagic habitats (4-556), coral communities (4-558), essential fish habitat (4-562), and other resources.

While the Draft PEIS recognizes that climate change may significantly impact the coasts and oceans of the United States, it fails to connect these and other climate change-induced threats to GHG emissions from the combustion of oil and gas and from all routine activities, which have a cumulative impact on climate change. An EIS must "consider the cumulative impact of the proposed action."[20] "The impact of greenhouse gas emissions on climate change is precisely the type of cumulative impacts analysis that NEPA requires agencies to conduct."[21] GHGs accumulate in the atmosphere and ultimately cause climate change. As "individually minor but collectively significant actions taking place over a period of time" (40 C.F.R. § 1508.7), GHG emissions clearly qualify as cumulative impacts, and so the failure of the Draft PEIS to account for and consider the cumulative impacts of GHGs is a violation of NEPA.

NEPA Requires the Draft PEIS to Account for Greenhouse Gas Emissions from Upstream and Downstream Operations Resulting from the 5-Year Program

Routine activities, including those upstream and downstream of oil and gas production, emit significant amounts of GHGs that must be quantified. Currently, the Draft PEIS only quantifies GHG emissions from activities on the OCS associated with production and exploration, e.g. service vessel trips and helicopter operations (see 4-133, Table 4.4.4-1 and 4-138, Table 4.4.4-2). However, routine activities at all stages of oil and gas production, from exploration to development to transportation to refining to decommissioning, would result from the Proposed 5-Year Program and so fall in the scope of the Draft PEIS (40 C.F.R. § 1508.25). Therefore, their impacts must be considered in the Final PEIS. The emissions from these activities would have significant environmental impacts. Yet, the Draft PEIS neglects GHG emissions from activities downstream of production, such as the refining of

[19] Core Writing Team, Pauchauri, R.K., and A. Reisinger (eds.). *Contribution of Working Groups I, II, and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, 2007*. IPCC, Geneva, Switzerland.
[20] *Kern v. US Bureau of Land Mgmt.*, 284 F.3d 1062, 1076 (9th Cir. 2002).
[21] *Center for Biological Diversity v. NHTSA*, 538 F.3d 1172, 1217 (9th Cir. 2008)

oil and gas and transportation of refined products to their point of consumption, and upstream of development, such as the construction of platforms. Given the need for the Final PEIS to fully account for GHG emissions resulting from the 5-Year Program as explained above, the Final PEIS must quantify GHG emissions from all activities upstream and downstream of oil and gas development and production on the OCS. To do so, BOEM could draw its system boundaries from the production of infrastructure necessary to produce OCS oil and gas to the combustion of the oil and gas products.

BOEM's Rationale for Not Calculating Greenhouse Gas Emissions from the Combustion of Oil and Gas is Flawed

BOEM's rationale for not calculating the GHG emissions resulting from the combustion of oil and gas produced under the Proposed 5-Year Program is flawed. BOEM claims that the scope of the Draft PEIS is too limited to account for such emissions, stating that "[c]onsumption of oil and gas is considered at a broader level when decisions are made regarding the role of oil and gas generally, including domestic production and imports, in the overall energy policy of the United States" (1-18). Although one could argue that the 5-Year Program is an important part of U.S. energy policy, BOEM claims that general decisions relating to oil and gas – including how much should be consumed and whether it should be produced domestically or imported – are not within the scope of the Proposed 5-Year Program and Draft PEIS. Put another way, BOEM suggests that the 5-Year Program has no direct bearing on general decisions relating to oil and gas. This statement, though, is disproved by the Draft PEIS itself.

The Draft PEIS finds that under the No Action Alternative, in which new leasing is not allowed under the Proposed 5-Year Program, reduced demand would substitute for 6% of the lost OCS oil and gas (4-496, Table 4.5.7-1).[22] Clearly, then, the Proposed 5-Year Program does have a direct bearing on the general decision of how much oil and gas the nation will consume, and where that oil and gas will come from. Similarly, determining how much oil the nation will consume falls within the scope of the Draft PEIS, because the direct impacts of the Proposed Action (40 C.F.R. § 1508.25) include consumption of the oil and gas produced. Consequently, the impacts of that consumption – including GHG emissions from the combustion of the oil and gas produced – must be included in the Draft PEIS.

Contrary to the Draft PEIS's claims, the fact that OCS oil and gas is merged with oil from other sources into a single, undifferentiated stream (1-18) does not preclude the need to account for GHG emissions from the combustion of oil and gas. Climate change is a global phenomenon, and GHG emissions contribute to climate change regardless of their point of origin. Although BOEM cannot predict where OCS oil and gas will be combusted, BOEM can predict and quantify in what sector OCS oil and gas will be combusted and the consequent GHG emissions. The U.S. Energy Information Administration ("EIA") projects levels of consumption of oil and gas by sector to 2035.[23] From these data, BOEM can determine the proportion of oil and gas produced under the 5-Year Program that will be consumed in each sector in the future. How much of each petroleum product a barrel of crude oil yields after refining is also available.[24] Finally, GHG emissions coefficients for the

[22] See "Reduced Demand" row at bottom of table.
[23] Energy Information Administration. *Annual Energy Outlook 2011*. 26 Apr. 2011.
[24] "Oil (petroleum): What Fuels Are Made From Crude Oil?" *Energy Information Administration.* Accessed 23 Dec. 2011. http://www.eia.gov/kids/energy.cfm?page=oil_home-basics

combustion of oil and gas in various sectors/applications are available from the U.S. Environmental Protection Agency ("EPA").[25] With the above datasets, BOEM is able to calculate GHG emissions from the oil and gas produced under the 5-Year Program, and as explained above must do so in order to satisfy NEPA.

Rough Sample Calculation of Greenhouse Gas Emissions from the Combustion of Oil and Gas

Even if BOEM deems it too difficult to calculate GHG emissions from the combustion of oil and gas produced under the 5-Year Program using the above datasets – a conclusion that, if made, must be thoroughly explained – BOEM is not exempt from calculating those GHG emissions. The calculation of GHG emissions from the combustion of oil and gas produced under the Proposed 5-Year Program can be greatly simplified. The emissions factors for the combustion of oil and gas, regardless of sector/application, is readily available from the U.S. Environmental Protection Agency.[26] Additionally, the 5-Year Program estimates how much oil and gas would be produced as a result of the Program. With these two data sets, calculating GHG emissions under the Proposed Action is a straightforward matter, as demonstrated by the Oceana analysis below. While this simplified calculation provides a much more accurate picture of the environmental impacts of the Proposed Action than no calculation, BOEM should undertake an appropriately-detailed analysis that takes into account all GHGs and black carbon, not just CO_2, and divides oil and gas combustion by sector/application.

Table 1: Projected emissions of CO_2 from the combustion of oil and gas resources that would be developed as a result of the Proposed 5-Year Program, i.e. the Proposed Action.

Resource	**CO_2 Emissions Factor**[a]	**Production Estimates (Low/High)**[b]	**CO_2 Emissions Estimate (million metric tons CO_2)**
Crude Oil	0.43 metric tons CO_2 per barrel oil	3.6 billion barrels	1,550
		8.13 billion barrels	3,500
Natural Gas	120,000 lb CO_2 per 10^6 scf gas	12.1×10^{12} scf	660
		34.7×10^{12} scf	1,890
		Total CO_2 Emissions (Low):	**2,210**
		Total CO_2 Emissions (High):	**5,390**

[a] Emissions factors estimated by the EPA.[27]
[b] Given values are for the sum of the low and high production estimates from Table 11 of the Proposed 5-Year Program[28] across all planning areas.

[25] Environmental Protection Agency. *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2008*. 15 Apr. 2010. Annex 2, Table A-36.
[26] Crude oil emissions factor: "Green Power Equivalency Calculator Methodologies." *EPA*. Apr 2011. http://www.epa.gov/greenpower/pubs/calcmeth.htm.
Natural gas emissions factor: "AP-42, Vol. 1, CH1.4: Natural Gas Combustion." *EPA*. July 1998. Page 1.4-6, Table 1.4-2. http://www.epa.gov/ttn/chief/ap42/ch01/final/c01s04.pdf.
[27] Id.
[28] U.S. Department of the Interior, Bureau of Ocean Energy Management. *Proposed Outer Continental Shelf Oil & Gas Leasing Program 2012-2017*. Nov. 2011.

IV. THE DRAFT PEIS DOES NOT ACCURATELY PORTRAY THE RELATIONSHIP BETWEEN SHORT- AND LONG-TERM TRADEOFFS IN VIOLATION OF NEPA

NEPA requires EISs to contain "a detailed statement... on the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity..." (42 USC Sec. 4223(C)(iv)). Chapter 6 of the Draft PEIS, which discusses that relationship, does not adequately meet this requirement because it contains erroneous claims about the impact of oil spills, and entirely overlooks the issues of climate change and ocean acidification.

Discussion Does Not Include Climate Change or Ocean Acidification

The Draft PEIS's discussion of the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity does not include any discussion whatsoever of climate change or ocean acidification. The Proposed Action would exacerbate climate change and ocean acidification via direct and indirect greenhouse gas emissions, which the Draft PEIS already (if imperfectly) acknowledges will result from the Proposed Action (see pg. 4-138, Table 4.4.4-2). The failure to mention the long-term impacts of climate change or ocean acidification in Chapter 6 of the Draft PEIS is a large oversight that needs to be corrected.

Climate change and ocean acidification will play major roles in shaping the long-term productivity of the United States' coastal regions, including the Gulf of Mexico and Arctic offshore and shoreline environments.[29] A modeling study of the Northeast Atlantic showed that the impacts of ocean acidification and climate change on biogeochemical cycles and ranges of important animals could lower their estimated catch potentials[30] by 20–30%.[31] An additional change in plankton communities due to ocean acidification and climate change could further reduce catch potentials by 10%.[32] Climate change and ocean acidification also threaten the world's tropical coral reefs through the combined stresses of warming sea surface temperatures and reduced carbonate accretion. Harm to coral reefs, in turn, threatens reef-associated fisheries, tourism, coastal protection and people within the U.S. Exclusive Economic Zone ("EEZ") offshore Hawaii, Florida, the U.S. Virgin Islands and U.S. flagged islands.[33] In the state of Hawaii alone, the net present value of the state's coral reefs is $9.7 billion over 50 years at a 3% discount rate.[34]

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[29] E.g.: Sumaila, U.R., W.W.L. Cheung, V.W.Y. Lam, D. Pauly and S. Herrick. (2011). Climate change impacts on the biophysics and economics of world fisheries. *Nature Climate Change*. Advanced Online.
Turner, R.E. "Chapter 6: Coastal Ecosystems of the Gulf of Mexico and Climate Change." *Integrated Assessment of the Climate Change Impacts on the Gulf Coast Region*. June 2003.
Fabry, V. J., Seibel, B. A., Feely, R. A., and Orr, J. C. 2008. Impacts of ocean acidification on marine fauna and ecosystem processes. *ICES Journal of Marine Science* **65**, 414–432.

[30] Specifically, 10-year average catch potential of 2050 relative to 2005.

[31] Cheung W. W. L., Dunne J., Sarmiento J. L. & Pauly, D. 2011. Integrating ecophysiology and plankton dynamics into projected maximum fisheries catch potential under climate change in the Northeast Atlantic. *ICES Journal of Marine Science*. doi:10.1093/icesjms/fsr012.

[32] Id.

[33] Hoegh-Guldberg, O. et al. 2007. Coral reefs under rapid climate change and ocean acidification. *Science* **318** (5857), 1737-1742.

[34] Cesar, H., et al. 2002. Economic valuation of the coral reefs of Hawaii, final report. NOAA Coastal Ocean Program. Available at: http://www.coralreef.gov/meeting18/evhcri_samoa_2007.pdf

Discussion Does Not Accurately Reflect Impacts of Oil Spills

Chapter 6 of the Draft PEIS incorrectly gauges the impacts of oil spills - and consequently the impacts of offshore drilling - in two ways. First, the Draft PEIS states, "[t]o date, there has been no discernible decrease in [biological] productivity in U.S. offshore areas where oil and gas have been produced for many years" (6-1 to 6-2). First of all, there is no analysis cited to support the suggestion that the pre-2010 impacts of decades of oil and gas industrialization in the Gulf of Mexico have not had an impact on biological productivity. That aside, however, the effects of the Deepwater Horizon oil spill alone are sufficient to disprove this statement, for the spill had obvious short- and long-term impacts on the Gulf of Mexico.

Whitehead et al., for instance, found adult Gulf killifish that were exposed to oil from the Deepwater Horizon spill exhibited genomic and physiological changes for over two months following exposure.[35] How these genomic and physiological changes will affect the adult killifish and, in turn, the killifish population as a whole, or even whether similar other species are similarly affected, has yet to be determined, but this evidence suggests the spill may have long-term impacts on the Gulf ecosystem. As Whitehead et al. state:

> "[m]arsh contamination with Deepwater Horizon oil coincided with the spawning season for many marsh animals, including killifish, and reproductive effects are predictive of long-term population-level impacts from oil spills." (3)

Furthermore, at the height of the Deepwater Horizon spill, 36% of federal waters in the Gulf of Mexico were closed to commercial and recreational fishing, representing an area of 86,985 square miles.[36] Fisheries closures triggered by the Deepwater Horizon spill are estimated to have caused a 20% loss in average annual U.S. commercial catch in the Gulf of Mexico, with a potential minimum loss in annual landed value of $248 million.[37] Such revenue losses and long-term effects of spill-induced fishery closures on fishing communities must be recognized in Chapter 6 of the Draft PEIS.

Chapter 6 of the Draft PEIS also errs by stating, "... the consequences of oil spills all contain the potential for disrupting coastal communities in the short term" (6-2). That statement ignores long-term impacts. Preliminary findings from the Deepwater Horizon spill as well as observations since the Exxon Valdez spill indicate that oil spills have the potential to disrupt coastal communities and the productivity and viability of fisheries in the long-term as well. Four years after the Exxon Valdez spill, the Pacific herring population in Prince William Sound collapsed, and it has not recovered after more than twenty years[38] (see Figure 1). About half of the egg biomass of Pacific herring was deposited within the oil trajectory, and an estimated 40% to 50% sustained oil exposure during early development. The resulting 1989 year-class (the year of the Exxon Valdez spill) displayed sublethal

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[35] Whitehead, A., et al. (2011). Genomic and physiological footprint of the *Deepwater Horizon* oil spill on resident marsh fishes. *Proc. Natl. Acad. Sci.* Early Edition.

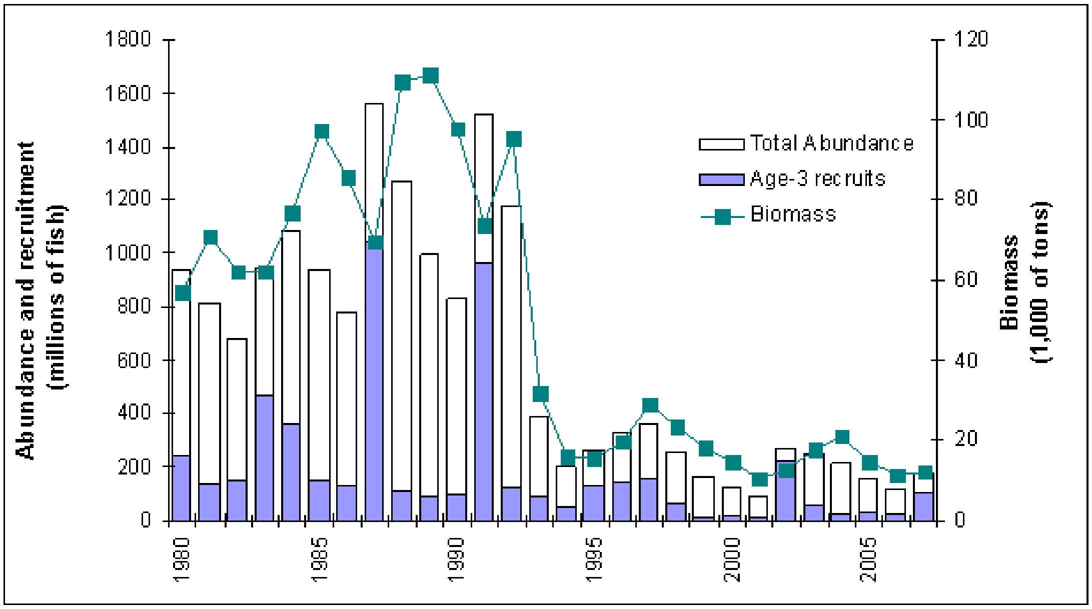
[36] NOAA. "NOAA Expands Fishing Closed Area in Gulf of Mexico. 21 June 2010. http://www.noaanews.noaa.gov/stories2010/20100621_closure.html.

[37] McCrea-Strub, A., et al. (2011) Potential impact of the Deepwater Horizon oil spill on commercial fisheries in the Gulf of Mexico. *Fisheries* 32: 332-336. *available at* http://www.seaaroundus.org/researcher/dpauly/PDF/2011/JournalArticles/PotentialImpactoftheDeepwaterHorizonOilSpill1.pdf

[38] "Pacific Herring." *Exxon Valdez Oil Spill Trustee Council*. Accessed 20 Dec. 2011. http://www.evostc.state.ak.us/recovery/status_herring.cfm.

effects in newly hatched larvae, primarily premature hatch, low weights, reduced growth, and increased morphologic and genetic abnormalities.[39] The adult herring population that returned to spawn four years later was reduced by 75%,[40] and the fishery has been closed for 15 of the 21 years since the spill.[41] Chapter 6 must be revised to reflect the fact that oil activities and subsequent accidents can impact the long-term productivity of marine resources.

Figure 1. Age-3 recruitment, total prefishery abundance and run biomass (metric tons) of Pacific herring in Prince William Sound, 1980-2008. The Exxon Valdez spill occurred in 1989 with a drastic drop in biomass of herring four years after the spill.



Source: Brown, E.D. et al 1996. Injury to the early life stages of Pacific herring in Prince William Sound after the Exxon Valdez oil spill. *Proceedings of the Exxon Valdez oil spill symposium. American Fisheries Society Symposium.* 18, 448-462.

The Deepwater Horizon spill also triggered several long-term threats to target fishery species and trophic levels in the Gulf of Mexico. Target species may be directly impacted by physical contact with oil contaminants, as well as indirectly affected via the degradation of important nursery and spawning habitats and disruption of trophic interactions.[42] These impacts can last up to 40 years or longer.[43]

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[39] Brown, E.D. et al 1996. Injury to the early life stages of Pacific herring in Prince William Sound after the Exxon Valdez oil spill. *Proceedings of the Exxon Valdez Oil Spill Symposium. American Fisheries Society*, 18, 448-462.
[40] Id.
[41] "Commercial Fishing." *Exxon Valdez Oil Spill Trustee Council*. Accessed 20 Dec. 2011. Online at: http://www.evostc.state.ak.us/recovery/status_human_fishing.cfm
[42] Peterson, C. H., S. D. Rice, J. W. Short, D. Esler, J. L. Bodkin, B. E. Ballachey, and D. B. Irons. (2003). Long-term ecosystem response to the *Exxon Valdez* oil spill. Science 302:2082–2086.
[43] Culbertson, J.B. et al. (2007). Long term biological effects of petroleum residues on fiddler crabs in salt marshes. *Marine Pollution Bulletin*, 54: 955-962.

The persistence of polycyclic aromatic hydrocarbons ("PAHs") has been shown to accumulate in American oysters near the Ixtoc-1 oil spill site, over twenty years after that spill ended.[44] After Ixtoc-1, there was also a decrease in biomass levels of zooplankton by a magnitude of four fold, which is a marked decline in productivity.[45] Although studies on Ixtoc 1 are largely lacking, the Final PEIS must acknowledge that significant long-term impacts have occurred from oil and gas activities in the Gulf of Mexico whether the drilling was in U.S. waters or not. Ixtoc 1 should serve as an indicator about how the Gulf of Mexico may have been altered after the Deepwater Horizon spill, and show that long-term risks are apparent for marine productivity.

Moreover, oil from the spill persists in the deep sea water column,[46] in mats on the seafloor,[47] and in sediments of coastal marshes,[48] further increasing the likelihood of long-term impacts on a variety of species, and indirectly on coastal communities. The persistence of oil in these environments could adversely impact ecosystems for years to come. While it may be too early to determine definitively the long-term impacts of the Deepwater Horizon spill, BOEM can not simply ignore the potential and early evidence for such impacts in the Final PEIS. The Final PEIS must consider these potential long-term impacts to some extent, even if they cannot be quantified. Furthermore, BOEM needs to acknowledge that spills can and often do have long-term impacts, as early data from the Deepwater Horizon spill suggest.

Ultimately, the Deepwater Horizon disaster threatens the long-term productivity of over 100 species of fish, crustaceans, mollusks and invertebrates that are commercially fished in the Gulf of Mexico. Fishing in the Gulf of Mexico has been a long-term driver of the Gulf economy; between 2000 and 2005, total annual commercial landings represented an average value of $1.38 billion.[49] With sustainable fisheries management and no sources of severe stress such as oil spills and climate change - both of which the Proposed Action would contribute to - this revenue stream could continue to drive part of the Gulf of Mexico economy. However, as demonstrated above, oil and gas drilling threatens the long-term integrity of Gulf of Mexico species. This tradeoff needs to be acknowledged in Chapter 6 of the Draft PEIS.

V. THE DRAFT PEIS RELIES ON AN OVERLY-SIMPLISTIC OIL SPILL RISK ANALYSIS THAT UNDERESTIMATES THE RISK OF LARGE AND CATASTROPHIC SPILLS

The Draft PEIS underestimates the risk of accidental oil spills in the Gulf of Mexico, summarized in Table 4.4.2-1 (pg. 4-109), by failing to take into account different spill rates across

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[44] Norena-Borroso, et al., (1999) Polynuclear aromatic hydrocarbons in American oysters Crassostrea virginica from the Terminos Lagoon, Campeche, Mexico. *Marine Pollution Bulletin,* 38(8), 637-645.
[45] Guzman, S.A. (1986) The impact of the Ixtoc-1 oil spill on zooplankton. *Journal of Plankton Research*, 8(3), 557-581.
[46] Reddy, C.M., et al. (2011). Composition and fate of gas and oil released to the water column during the *Deepwater Horizon* oil spill. *Proc. Natl. Acad. Sci*. Early Edition.
[47] Clement, T.P., Hayworth, J.S., and V. Mulabagal. Comparison of the chemical signatures of tar mat samples deposited by Tropical Storm Lee in September 2011 with oil mousse samples collected in June 2010. *Auburn University*. 20 Sept. 2011.
[48] Whitehead, A., et al. (2011). Genomic and physiological footprint of the *Deepwater Horizon* oil spill on resident marsh fishes. *Proc. Natl. Acad. Sci*. Early Edition. Pg. 4.
[49] McCrea-Strub, A., et al. (2011) Potential impact of the Deepwater Horizon oil spill on commercial fisheries in the Gulf of Mexico. *Fisheries* 32: 332-336. *available at* http://www.seaaroundus.org/researcher/dpauly/PDF/2011/JournalArticles/PotentialImpactoftheDeepwaterHorizonOilSpill1.pdf

drilling depths and well types. Ultimately, this leads to an underestimation, and a biased discussion, of the risk of large spills (i.e., greater than 1,000 barrels) and of the environmental impacts such spills would have. This does not constitute a "full and fair discussion of significant environmental impacts" (40 C.F.R. § 1502.1). BOEM must take into account relevant variables, such as water depth, and their impact on the risk of spills during drilling and production.

The oil spill risk analysis used in the Draft PEIS hinges on historical spill rates classified by spill size. As presented in Table 4.4.2-1, the spill rates seem to be calculated based on the assumption that spills occur in direct proportion to the volume of oil handled, an approach that pools data across all other variables (e.g., water depth). This is the same methodology that BOEM has employed in previous EISs.[50] However, the Draft PEIS does not fully describe the methodology used to calculate spill risk (see, for instance, 4-109). Rather, it references an unpublished paper "Anderson (in preparation)" (id.), which presumably updates the 2000 spill risk analysis by Anderson and LaBelle.[51] Because the Anderson paper is in preparation, it is premature to cite it and since it is not publically available, its use effectively nullifies the public's ability to corroborate its methodology and spill risk calculations. This is a major oversight. Because oil spills can have significant impacts on biological resources and the environment,[52] having an accurate spill risk analysis is crucial to the overall integrity of the Draft PEIS and its ability to provide a "full and fair discussion of significant environmental impacts" (40 C.F.R. § 1502.1). Despite its importance, and even though the updated analysis was under development as far back as April 19, 2011,[53] BOEM failed to complete the Anderson paper prior to issuing the Draft PEIS for reasons that are not clear. BOEM must make this paper publically available prior to issuing the Final PEIS and improve its methods to look at other risk factors if it has not done so.

In the absence of a copy of the Anderson paper relied on by BOEM, it appears likely to us that the methodology for estimating the number of spills mimics that employed in previous offshore drilling EISs. As previously stated, this methodology pools oil spill and production data across all variables, including drilling depth, to calculate a ratio for the number of oil spills per barrel of oil produced. This ratio is then multiplied by the total projected volume of oil to be produced under the Proposed Action to calculate a total number of projected spills and volume of spilled oil that will occur due to the Proposed Action. For instance, Table 4.4.2-1 of the Draft PEIS estimates that there will be 1-2 "large" oil spills from platforms in the Gulf of Mexico due to the Proposed Action.

Grouping projected spill rates by spill size only and not by other variables assumes that the oil produced across all water depths, environments, well types and other factors has an equal spill risk. However, this is not true. Deepwater and ultra-deepwater wells pose significantly greater risks than shallow wells due to increased complexity and harsher environments, making deepwater operations

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[50] E.g., Bureau of Ocean Energy Management. *Final Supplemental Environmental Impact Statement, Western Planning Area Lease Sale 218*. Aug. 2011. Vol I, pg. 3-33.

[51] Anderson, C.M., and R.P. LaBelle. 2000. "Update of Comparative Occurrence Rates for Offshore Oil Spills." *Spill Science and Technology Bulletin*, **6**: 303-321.

[52] E.g., "incremental impacts of accidental spills associated the proposed action on marine mammals would be small to large" (Draft PEIS 4-590).

[53] Bureau of Ocean Energy Management. *Final Supplemental Environmental Impact Statement, Western Planning Area Lease Sale 218*. Aug. 2011. Vol I, pg. 3-33.

inherently riskier, as discussed in Section II of this document.[54] Consequently, one barrel of oil produced in deepwater has a greater spill risk than one barrel of oil produced in shallow water. BOEM's own preliminary statistics corroborate this claim. According to BOEM, since 2006 the rate of loss of well control events ("LWC") per well drilled has been higher in deepwater[55] (1 LWC per 192 wells drilled) than in all water depths (1 LWC per 273 wells drilled).[56] In other words, the risk of losing well control, which can lead to a blowout and spill, is greater in deepwater than shallow water. This is likely true for all frontier areas, including the Arctic OCS. Yet, the Draft PEIS fails to include drill depth as a variable in its analysis of spill risk even though much of the area covered by the Proposed Action is deepwater. As a result of this omission, the spill risk analysis in the Draft PEIS (e.g., in Table 4.4.2-1) does not accurately estimate the number of spills that will likely occur as a result of the Proposed Action, prohibiting a "full and fair discussion" (40 C.F.R. § 1502.1) and thereby violating NEPA. To improve its spill risk analysis, at the very least BOEM must incorporate in the Final PEIS the increased risk of spills at deeper water depths. This could be done by dividing exploration and production activities by water depth and then estimating the number of spills from those activities with historical spill frequency data from different water depth classes, i.e. deepwater versus non-deepwater. Ultimately, though, BOEM must utilize a more advanced risk analysis methodology.

VI. THE CUMULATIVE IMPACTS ANALYSIS IN THE DRAFT PEIS HAS MULTIPLE SHORTCOMINGS THAT VIOLATE NEPA

Discussion of Cumulative Climate Change Impacts on Marine Mammals in Gulf of Mexico is Insufficient

In describing the cumulative impacts of climate change on marine mammals in the Gulf of Mexico, the Draft PEIS does not handle incomplete and unavailable information in the manner required by NEPA. The Draft PEIS states that "[i]t is not possible at this time to identify the likelihood, direction, or magnitude of any changes in the environment of the GOM due to changes in the climate, so it is too speculative to further discuss climate change impacts on marine mammals" (4-588). In other words, the Draft PEIS uses a claim of incomplete or unavailable information to entirely avoid discussing what impacts climate change will have on marine mammals in the region. That approach is contrary to clear NEPA requirements for the handling of incomplete or unavailable information.

NEPA requires that, when information that is "essential to a reasoned choice among alternatives" (40 C.F.R. § 1502.22(a)) is incomplete or unavailable and "the overall costs of obtaining it are exorbitant or the means to obtain it are not known, the agency shall include... a summary of existing credible scientific evidence which is relevant to evaluating the reasonably foreseeable significant adverse impacts on the human environment" (40 C.F.R. § 1502.22(b)). In the case of cumulative climate impacts on marine mammals in the Gulf of Mexico, BOEM engages in no such

[54] E.g., "Deep Water: The Gulf Oil Disaster and the Future of Offshore Drilling." *National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling*. Jan 2011. Page vii.
[55] Deepwater is defined as greater than 1,000 feet.
[56] Izon, David. Presentation at the Offshore Energy Safety Advisory Committee Meeting. 7 Nov. 2011. Department of the Interior, Washington DC.

endeavor. Information on the effects of climate change on marine mammals is essential to a reasoned choice among alternatives, as climate change poses a suite of threats to marine mammals, from shifting distribution and abundance of prey[57] to spreading the extent of low oxygen dead zones.[58] The Draft PEIS contains no summary of existing scientific evidence that could inform what impacts climate change will have on marine mammals, even though papers have been published on the effects of climate change on the Gulf of Mexico and on marine mammals in general.[59]

How BOEM Estimated the Total Effect of Cumulative Impacts on Each Resource is Not Discernible

The method by which BOEM synthesized the effects of various cumulative impacts and estimated a total potential cumulative effect on each resource is not apparent. In the Draft PEIS, BOEM simply lists the effects of various cumulative impacts, and then states what the combined effect of these impacts would be without explaining how it synthesized the effects of all of the cumulative impacts. In the Final PEIS, BOEM should clarify how it drew such conclusions. Doing so would allow for much better public engagement, as the current Draft PEIS prevents the public from determining whether the aggregate effect of many cumulative impacts is accurate. In part, the lack of transparency is due to the Draft PEIS not discussing whether cumulative impacts are additive or multiplicative in nature (discussed at length below), which greatly alters their aggregate potential cumulative effect on a given resource. The Draft PEIS also lacks adequate discussion of how uncertainties regarding the impacts of past and future activities are handled, further hampering the transparency of BOEM's cumulative impacts analysis.

The Draft PEIS's lack of discussion of the cumulative effect of multiple oil spills illustrates its failure to clearly show how it synthesized the effects of various cumulative impacts. The Draft PEIS states that "[t]he incremental impacts of accidental spills associated with the proposed action on marine mammals would be small to large" (4-590), but also states that "[t]he cumulative impacts of past, present, and future oil spills on marine mammals would be minor to moderate" (4-590). These two statements seem to conflict. If great uncertainty surrounds the effect of one accidental spill, the uncertainty surrounding the aggregate effect of multiple accidental spills must be even greater. Knowing this, it is puzzling how multiple events each with potentially large effects on marine mammals could not potentially have a "major" cumulative effect on marine mammals.[60] Similar conflicts appear in the discussion of oil spill impacts on birds (4-595 and 4-596). In both cases, BOEM does not explain how it arrived at its "minor to moderate" conclusions, nor does it illustrate how it grappled with major uncertainty in the effects of cumulative impacts. Both processes should be described more clearly in the Final PEIS.

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[57] E.g., Cheung, W.W.L., V.W.Y. Lam, J.L. Sarmiento, K. Kearney, R. Watson., and D. Pauly. (2009). Projecting global marine biodiversity impacts under climate change scenarios. *Fish and Fisheries* **10**: 235-251.
[58] Diaz, R.J. and Rosenberg, R. 2008. Spreading dead zones and consequences for marine ecosystems. *Science*, 321 (5891): 926-929.
[59] *See, e.g.*, Justic, D., Rabalais, N.N., and Tuner, R.E. (1996). Effects of climate change on hypoxia in coastal waters: a doubled CO2 scenario for the northern Gulf of Mexico. *Limnol. Oceanogr.* 41(5) 992-1003.
Cheung, W.W.L., V.W.Y. Lam, J.L. Sarmiento, K. Kearney, R. Watson., and D. Pauly. (2009). Projecting global marine biodiversity impacts under climate change scenarios. *Fish and Fisheries* **10**: 235-251.
[60] Where "major" is defined per the criteria on page 4-10 of the Draft PEIS.

Synergistic and Multiplicative Interactions between Cumulative Impacts are Not Considered

The Draft PEIS does not consider the potential for synergistic or multiplicative interactions between cumulative impacts in violation of NEPA. Guidance for considering cumulative impacts issued by the Council on Environmental Quality ("CEQ") highlights how some cumulative impacts may be synergistic or multiplicative rather than simply additive.[61] Rather than analyzing the potential for multiplicative/synergistic impacts, the Draft PEIS only lists the incremental effects of various cumulative impacts. Its analysis of the cumulative impact of vessel trips on marine mammals is representative of the type of analysis employed throughout the cumulative impacts section. The Draft PEIS states, "[t]he addition of up to 600 OCS vessel trips per week under the proposed actions could result in minor to moderate incremental impacts to marine mammals, be largely short term, and not result in population-level effects" (4-586). Nowhere in the marine mammals section does BOEM consider possible multiplicative/synergistic effects of increased vessel traffic with other cumulative impacts. For instance, as climate change shifts the ranges of marine mammal species,[62] more marine mammals could be exposed to and consequently collide with vessel traffic in the Gulf of Mexico, an impact that is not currently captured by the Draft PEIS. This problem is not unique to the marine mammal section; in reviewing the cumulative impacts discussion for the Gulf of Mexico (Section 4.6) of the Draft PEIS, Oceana found no mention at all of potential synergistic/multiplicative effects. BOEM must strengthen its cumulative impact analysis in the Final PEIS by considering such effects.

Climate change, in particular, is a cumulative impact for which synergistic/multiplicative interactions with other impacts must be considered. While the exact impacts of climate change on the nation's coasts and oceans are not fully known at this time, it is clear that climate change may adversely affect species and even entire ecosystems,[63] making them more susceptible to future impacts from oil and gas activities like catastrophic spills or even routine operations. The Draft PEIS discusses some climate change effects in Section 3.3, but does not link this discussion to the cumulative impacts analysis. The Draft PEIS needs to consider the synergistic/multiplicative effects of climate change and other cumulative impacts, as well as synergistic/multiplicative impacts among all other cumulative impacts.

The Draft PEIS Incorrectly Claims that Missing Information Pertaining to Climate Change Impacts is Not Essential to a Reasoned Choice among Alternatives

The Draft PEIS wrongly claims that missing information pertaining to the impacts of climate change on marine and coastal birds is not essential to a reasoned choice among alternatives. BOEM's rationale for reaching this conclusion is that, because the information is missing for all alternatives, it is irrelevant in choosing among them (4-594). That suggestion is flawed for one simple reason: the Proposed Action and alternatives would affect climate change differently and so lead to different impacts on birds.

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[61] Council on Environmental Quality. *Considering Cumulative Effects Under the National Environmental Policy Act*. Jan. 1997.Id. Pg. 42.
[62] Learmonth, J.A., C.D. Macleod, M.B. Santos, G.J. Pierce, H.Q.P. Crick and R.A. Robinson. (2006.) Potential effects of climate change on marine mammals. *Oceanography and Marine Biology: An Annual Review* **44**: 431-464.
[63] U.S. Global Change Research Program. *Global Climate Change Impacts in the United States*. June 2009. Pg. 79-88.

The effects of climate change may not be entirely clear, but the impacts of climate change would be different under the different alternatives considered in the Draft PEIS. Better information on the effects of climate change on birds, which does exist in the literature, would allow for a more accurate understanding of the differential impacts of the alternatives, and thus allow for a more reasoned choice among alternatives. BOEM should correct its erroneous statement that missing information pertaining to the impacts of climate change is not essential to a reasoned choice among alternatives, and modify its Final PEIS to reflect this correction accordingly.

VII. THE DRAFT PEIS FAILS TO ACKNOWLEDGE PERSISTENT SHORTCOMINGS IN THE REGULATION AND SAFETY OF OFFSHORE OIL AND GAS DRILLING THAT IMPACT SPILL RISK

Since the Deepwater Horizon spill, BOEM and BSEE have promulgated new regulations in an attempt to make offshore drilling safer. These new regulations are discussed at length in Section 4.3.4.3.4 of the Draft PEIS. We support and applaud ongoing efforts to make offshore drilling safer, but Oceana has identified numerous problems in the regulations of the offshore industry in its report *False Sense of Safety*.[64] These problems fall into two categories: shortcomings in the new safety measures implemented since the Deepwater Horizon spill; and persistent overarching problems in the regulation of offshore activities, such as insufficient inspection and oversight capabilities and inadequate penalties for violations. As a result, BOEM and BSEE have failed to make offshore drilling substantially safer since the Deepwater Horizon disaster.

The Draft PEIS does not acknowledge any problems in the regulation of offshore oil and gas activities, despite its ten-page discussion of newly implemented regulations and their purported positive effect on offshore safety (4-90 to 4-99). For instance, the Draft PEIS highlights how BSEE now requires multi-person inspection teams, which are supposed to improve oversight by leading to more and better inspections of facilities (4-99). Yet, the Draft PEIS does not mention that funding for BSEE remains inadequate for BSEE to, as stated by former Director Michael Bromwich himself, "do the job the public deserves."[65]

Furthermore, the claims in the Draft PEIS regarding the positive safety effects of new regulations are largely unsubstantiated. For instance, the Draft PEIS states, "[the new regulations] create a more robust regulatory system that strikes the right balance to ensure that energy development is conducted safely and in an environmentally responsible manner, ..." (4-99). But the claim that these measures now ensure that energy development is "conducted safely" is never substantiated; no formal analysis is performed in the Draft PEIS, nor was one completed in the rulemakings promulgating the new safety regulations. We don't believe that such a statement could be substantiated given the weaknesses in the regulations. Either way, BOEM should not make the claim without providing any evidence of it being true.

[64] *False Sense of Safety*, Oceana's report on persistent shortcomings in the regulation of offshore drilling, is available online at http://www.oceana.org/safetyreport.

[65] Bromwich, Michael R. "Criticizing the inspectors." *The White House Blog*. 3 Nov. 2010. http://www.whitehouse.gov/blog/2010/11/03/criticizing-inspectors.

These imbalanced and unsupported claims of positive safety effects violate NEPA guidelines as well as the Department of the Interior's new scientific integrity policy. NEPA requires an EIS to "provide full and fair discussion of environmental impacts" (40 C.F.R. § 1502.1). While the new regulations themselves are not environmental impacts, they directly affect the impact analysis and hence affect BOEM's discussion of the new regulations. A discussion of environmental impacts that is predicated upon an imbalanced, unsubstantiated and incomplete set of factors that drive those impacts will itself be imbalanced, unsubstantiated and incomplete. Thus, it is crucial for a full and fair discussion of environmental impacts that the discussion of new regulations (and other factors influencing environmental impacts) be full and fair as well, which they are not. An objective analysis of the weaknesses and insufficiencies in the regulations is called for here.

The Department's new scientific integrity policy similarly demands a more balanced discussion of the new safety regulations. The policy requires science to be communicated "clearly, honestly, objectively, thoroughly, [and] accurately" (Section 3.7.2). As previously explained, the current communication of the new safety measures, and consequently the risks and effects of oil spills and other impact factors, is not balanced or objective. This directly violates the Department's new scientific integrity policy. This PEIS provides an ideal and timely opportunity for the Department to demonstrate its commitment to transparency and clarity in its scientific communications, but the Draft PEIS has failed to meet that promise.

In order to comply with NEPA and to satisfy the Department of the Interior's scientific integrity policy, the Final PEIS must present a more balanced discussion of new regulations and other safety measures implemented since the Deepwater Horizon spill. To do so, the Final PEIS should discuss persistent safety concerns in offshore drilling that have not yet been addressed, as well as shortcomings in the new regulations. It also must present detailed analyses to support its claim that the new regulations and other measures have improved offshore safety. We have submitted with this letter a copy of our analysis and report on the subject for your consideration.

VIII. THE DRAFT PEIS DOES NOT ADEQUATELY ACCOUNT FOR THE IMPACTS OF THE DEEPWATER HORIZON SPILL

The Draft PEIS makes several misleading claims about the impacts of the Deepwater Horizon spill. It has also not updated several parts of its analysis to acknowledge the risks of expanded offshore oil and gas drilling in the Gulf of Mexico that were brought to light by the disaster. NEPA requires that an EIS provides "a full and fair discussion of environmental impacts" (40 C.F.R. § 1502.1) and that its "[environmental] information must be of high quality" (40 C.F.R. § 1500.1). Thus, if BOEM does not update its analysis of offshore drilling risks and correct its misleading claims about the Deepwater Horizon spill in the Final PEIS, it will be in violation of NEPA.

The ecological baseline of the Gulf of Mexico has changed due to the Deepwater Horizon spill and the Draft PEIS must fully address these impacts, especially for protected and endangered species such as sea turtles, marine mammals and migratory birds as well as commercially important species. Acknowledging the small amount of information that has been published outside of the Natural Resources Damage Assessment ("NRDA") process is not an adequate measure of the impacts of the

Deepwater Horizon spill. Rather, BOEM must seek its own independent studies and consultation to address the long-term impacts to marine resources.

Overall, there are few attempts to project or scale stranding and carcass data acquired by the National Marine Fisheries Service ("NFMS") and Fish and Wildlife Service ("FWS") in order to estimate the true long-term effects of the Deepwater Horizon spill on populations of marine animals.

Furthermore, there are no projections about the persistence of polycyclic aromatic hydrocarbons ("PAHs") in deep sea plumes and sediments, which is relevant in that it results in continued, longer-term exposure and potentially ongoing impacts. There are also no attempts to explain the limitations of the NRDA sampling process, both in terms of sampling frequency and approaches, in characterizing the cumulative long-term exposure and resulting effects of PAH exposure on Gulf species (i.e., limited resources for sampling and use of grab samples versus Semi Permeable Membrane Devices ["SPMDs"],which better assess long-term exposure to PAHs). The Draft PEIS also ignores long-term datasets like NOAA's Mussel Watch Program, which employs the use of shellfish to test for ambient contamination. Their published data about the impacts of the Deepwater Horizon spill should soon be available and will provide a good indicator of the health of important commercial fisheries as well as the bioaccumulation of oil in benthic species. Explaining the extent of contamination that was created by the Deepwater Horizon spill is necessary because past studies have shown that the presence of PAHs at levels even as low as 1 part per billion present chronic threats to marine species such as fish larvae.[66]

The Draft PEIS states:

> [t]he few initial studies suggest that, despite occurring during the spawning period for many GOM fishes, the Deepwater Horizon event did not have an immediate negative impact on fish populations (including juvenile age classes [*sic*], although there remains the potential for long-term population impacts from sublethal and chronic exposure (Fodrie and Heck 2011). (3-147)

NOAA has created two different computer models that predict up to a 4% loss in the future spawning biomass of bluefin tuna if catch levels remain static and no other large scale disturbances occur.[67] Although these are models and the true impacts to adult fish as well as the 2010 year class of bluefin tuna larvae remain unknown, this 4% loss represents an immediate negative effect on fish populations that is higher than the largest predictions made by BOEM in previous multi-year lease sales that predicted a maximum of 1% loss in fish populations from any sized oil spill. Additionally, although the 4% loss in larvae may fall into levels of natural variation, additional sublethal impacts to developing larvae such as impacts to reproduction as seen in killifish could greatly impact future populations which are already struggling from overfishing.[68] The true impact to recruitment and the overall population of bluefin due to the Deepwater Horizon will not be realized for years, but there are still legitimate reasons for concern.

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[66] Marty, G.D. et al., (1997). Ascites, premature emergence, increased gonadal cell apoptosis, and cytochrome P4501A induction in pink salmon larvae continuously exposed to oil-contaminated gravel during development. *Canadian Journal of Zoology*, 1997, 75:(6) 989-1007, 10.1139/z97-120

[67] Borenstein, Seth. "Bluefin tuna probably OK after BP oil spill." *The Miami Herald*. 15 Dec. 2011. http://www.miamiherald.com/2011/12/15/2546144/noaa-bluefin-tuna-probably-ok.html.

[68] Whitehead, A., et al. (2011). Genomic and physiological footprint of the *Deepwater Horizon* oil spill on resident marsh fishes. *Proc. Natl. Acad. Sci*. Early Edition.

The Draft PEIS also inaccurately states that the "landings of shrimp also do not suggest any reduction in shrimp populations" (3-147). The Draft PEIS cites data that was taken from the Gulf of Mexico Large Marine Ecosystem and not the specific areas that were most impacted by the Deepwater Horizon oil spill, such as Louisiana. An Oceana analysis of recent versus historical landings data of brown shrimp caught in Louisiana shows that the peak brown shrimp fishing months of May and June were significantly lower in 2010 and 2011 (see table below).

Table 2: Louisiana Brown Shrimp Landings Data for Peak Months in Relation to Deepwater Horizon Oil Spill

Temporal Relation to Deepwater Horizon Spill	**Year**	**Month**	**Catch Landing (lbs.)**	**Catch Value ($)**
Pre-Spill	Average 1990-2009	May	17,830,428	15,131,364
During Spill	2010	May	5,500,179	5,779,231
Post Spill	2011	May	12,533,571	8,966,593
Pre-Spill	Average 1990-2009	June	17,641,275	18,826,222
During Spill	2010	June	7,210,117	9,614,227
Post Spill	2011	June	15,082,113	10,385,926

Source: 2010-2011 data requested from Louisiana Department of Wildlife and Fisheries, analyzed by Oceana. 1990-2009 data from NOAA Fisheries, Annual Commercial Landings Statistics. Available online at: http://www.st.nmfs.noaa.gov/st1/commercial/landings/annual_landings.html)

The Draft PEIS also does not take into account recent reports from shrimp fishermen, seafood distributors, and shrimp fishing associations in Louisiana that claim that they are witnessing craniofacial disorders in shrimp such as no eyes,[69] and that historically abundant shrimp fishing grounds are 80% or more below normal catch levels.[70] Although freshwater input and temperature variations may have also influenced shrimp populations, there is still reason for concern that persistent PAH levels have stunted the growth and/or reproduction of shrimp and may continue to impact their populations and the fishery. Indeed, the white shrimp season has been dubbed by many as the worst in memory.[71] Further analysis of annual data from brown and white shrimp landings in Louisiana for 2011 alongside Catch Per Unit Effort ("CPUE") data of shrimp fishing in regions that were impacted by the oil spill will provide a better indicator of the health of shrimp populations after the Deepwater Horizon spill. Currently, it is premature for the Draft PEIS to claim that no impacts to shrimp populations or shrimp fisheries have occurred from the Deepwater Horizon spill.

The Draft PEIS also does not fully evaluate the risks of 'reoiling' events from Deepwater Horizon oil that remains in or beneath sediment. Recent events such as Tropical Storm Lee revealed miles of tar mats that remain underneath the surface sand as well as abandoned cleanup equipment that

[69] CNN Interview with Clint Guidry, President of the Louisiana Shrimpers Association. Originally aired on 23 November 2011 12:00 ET. Transcript Available at: http://edition.cnn.com/TRANSCRIPTS/1111/23/cnr.04.html

[70] "Gulf shrimp are scarce this season." New York Times, 10 Oct. 2011. http://www.nytimes.com/2011/10/11/us/gulf-shrimp-are-scarce-this-season.html

[71] "Gulf shrimp are scarce this season." New York Times, 10 Oct. 2011. http://www.nytimes.com/2011/10/11/us/gulf-shrimp-are-scarce-this-season.html

was left behind after the initial spill cleanup.[72] The erosion and human-caused disturbance to coastal areas from oil cleanups can be equal to, if not more harmful than, the oil itself. The subsequent environmental and social costs of future cleanups should be accounted for as a significant and long-term impact of the Deepwater Horizon spill and a direct consequence of oil and gas activities in the region.

Due to the lack of information being provided by the NRDA process in a timeframe relevant to the Final PEIS and 5-Year Program, BOEM needs to conduct its own independent studies using its Environmental Studies Program ("ESP"). These studies need to examine the true impacts of the Deepwater Horizon spill and give a full and fair description of the risks of continued oil and gas activities in the Gulf of Mexico, as required by NEPA.

Modeling Environmental Sensitivity of the Gulf of Mexico in Light of the Deepwater Horizon Spill

It is necessary for BOEM to analyze the degree to which resources have been affected by the Deepwater Horizon spill and use the findings to model the impacts of potential oil and gas activities at the programmatic level. This information is necessary for BOEM to provide "a full and fair discussion of environmental impacts" (40 C.F.R. § 1502.1) based on high quality environmental information (40 C.F.R. § 1500.1), as required by NEPA. Without this information, BOEM and the public are unable to make a reasoned choice among alternatives for the Gulf of Mexico (40 C.F.R. § 1502.1).

Environmental sensitivity and marine productivity analysis should be top considerations for a reasoned choice among the alternatives for the Secretary. There are a variety of methodologies available that could be utilized in the Final PEIS that would weigh the predicted impacts of oil and gas activities on biodiversity and marine resources that were already impacted by the Deepwater Horizon spill. The Draft PEIS does not present solutions for ways to incorporate uncertainties and risks posed by the Deepwater Horizon spill into further analysis about how expanded offshore oil and gas drilling in the region could impact endangered or commercially important species. The following models and methodologies could be used to create an adequate environmental sensitivity analysis. This analysis should then be incorporated into the Final PEIS in order for a fair decision to be made regarding programmatic oil and gas activities in the Gulf of Mexico.

Ecosystem based models are needed to predict how expanded offshore oil and gas drilling in the Gulf of Mexico would impact the marine environment and resources. Fulton et al. 2011 demonstrates an ecosystem based model called the Atlantis modeling framework which has been used for decades for marine management decisions making.[73] This modeling framework is being coupled to climate, biophysical and economic models to help consider climate change impacts, monitoring schemes and multiple use management.[74] This model could be utilized in the Final PEIS to give a comprehensive view of the impacts of oil and gas activities on water quality, air quality, greenhouse gas emissions, oil spill risk, affected habitats, subsistence communities and other resources. Using this

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[72] Clement, T.P., Hayworth, J.S., and V. Mulabagal. Comparison of the chemical signatures of tar mat samples deposited by Tropical Storm Lee in September 2011 with oil mousse samples collected in June 2010. *Auburn University*. 20 Sept.
[73] Fulton, E. A. et al (2011). Lessons in modeling of marine ecosystems: the Atlantis experience. *Fish and Fisheries*, 12(2), 171-188.
[74] Id.

model would greatly improve the PEIS by giving it a more encompassing view of oil and gas activities weighed against affected environments and the multiple long-term uses that have been described within the lease sale areas in the 5-Year Program.

Another good example of an applied environmental sensitivity index is Grilli et al. 2011,[75] which was used for offshore wind site assessment in the Rhode Island Special Area Management Plan. This model incorporates fisheries, recreation and biodiversity to weigh the impacts of siting offshore wind in certain locations off Rhode Island. This model could be further scaled up to give an impact index for the 5-Year Program's proposed oil and gas activities in the Gulf of Mexico Large Marine Ecosystem by incorporating multiple uses and biodiversity. The creation of the Grilli et al. 2011 model was built upon ecosystem based management concepts developed by McLeod and Leslie 2009.[76]

These modeling studies will require consultation from NOAA and FWS about endangered species and commercially important species. In light of such a large stressor like the Deepwater Horizon spill it is even more imperative that the Final PEIS adequately model how the Gulf of Mexico has changed and how it could be further impacted by offshore oil and gas activities in the 5-Year Program in order to make a reasoned decision amongst the alternatives.

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The Draft PEIS for the Proposed 5-Year Program suffers from serious flaws and omissions that must be addressed in the Final PEIS in order to comply with NEPA and OCSLA. Based on the Draft PEIS, it appears that BOEM has not learned from the Deepwater Horizon spill or the many decades of impacts on the Gulf of Mexico, and that the bureau is continuing to prioritize oil and gas development over environmental and human protection. Such a path will lead to another human and environmental tragedy.

Fortunately, the Final PEIS offers BOEM an opportunity to fundamentally change course and reassess its prioritization of oil and gas development over environmental protection. In so doing, BOEM should address the omissions and flaws discussed above, and ultimately select an alternative in its Final PEIS that does not simply continue failed policies that have led to tragedies and massive environmental degradation in the Gulf of Mexico. Such an alternative may involve the development of alternate/renewable energy sources. We appreciate the opportunity to submit comments on this important document, and look forward to reviewing the Final PEIS.

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[75] Grilli, A. R. et al. (2011). Ecosystem services typology: a wind farm siting tool. *International Society of Offshore and Polar Engineers (ISOPE).* Submitted to Journal of Environmental Engineering.
[76] Mcleod, K., and Leslie, H. (2009). Ecosystem based management for the oceans. Island Press, Washington, D.C.

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Southern Environmental Law Center

APPENDIX B:

"NET PUBLIC BENEFITS ANALYSIS OF THE PROPOSED OUTER CONTINENTAL SHELF OIL & GAS LEASING PROGRAM: A CRITIQUE"

Net Public Benefits Analysis of the Proposed Outer Continental Shelf Oil & Gas Leasing Program

A Critique

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Synopsis

In November 2011, the Department of Interior's Bureau of Ocean Energy Management (BOEM) issued the proposed Outer Continental Shelf (OCS) Oil and Gas Leasing Program for 2012–2017 (proposed Program) and accompanying Draft Programmatic Environmental Impact Statement (DPEIS).[1] Public comments have been received on the DPEIS and are being sought on the proposed Program.[2] The Outer Continental Shelf Lands Act (OCSLA) directs the Secretary of the Interior to manage the OCS "in a manner that considers economic, social and environmental values of renewable and nonrenewable resources."[3] This requirement, in combination with other provisions of law, is designed to ensure that the Program is planned and operated in a manner that maximizes net public benefits taking into consideration all relevant benefits and costs to society.

Section IV of the proposed Program documentation summarizes an analysis of net public benefits (NPB) completed in a separate report.[4] The NPB analysis quantifies the social benefits and costs of proposed OCS activities, as well as the costs of energy substitutes avoided by implementing the Program. Center for Sustainable Economy completed a preliminary review of the NPB analysis, its depiction in the proposed Program and its incorporation into the DPEIS. Our review is based on best practices of the economics profession as well as the plain language of controlling statutes, executive orders, regulations, and federal guidance. Our critique identifies five problematic areas of both the NPB analysis and DPEIS that work to significantly exaggerate the purported economic and social benefits of the Program:

- The DPEIS and NPB present a biased characterization and analysis of the no action alternative that significantly understates its economic and social value.
- The NPB analysis overestimates Program benefits by including private profits, relying on unwarranted assumptions about the effects of OCS oil and gas supplies on prices and by failing to account for final petroleum product exports.
- The NPB analysis underestimates Program costs by excluding costs of public subsidies, ecosystem service damages and carbon emissions damage.
- The DPEIS fails to incorporate the NPB analysis in a manner prescribed by NEPA and its implementing regulations.
- The DPEIS and NPB analysis fail to model the effects of a wide range of policy interventions that affect Program economics.

We begin by describing our standard of review, and then provide detail on each of these areas of critique.

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[1] U.S. Department of the Interior. Bureau of Ocean Energy Management. 2011a. Outer Continental Shelf Oil and Gas Leasing Program: 2012-2017. Draft Programmatic Environmental Impact Statement.
[2] U.S. Department of the Interior. Bureau of Ocean Energy Management. 2011b. Proposed Outer Continental Shelf Oil and Gas Leasing Program: 2012-2017.
[3] 43 U.S.C. § 1344 (a) 1.
[4] U.S. Department of the Interior. Bureau of Ocean Energy Management. 2011c. Economic Analysis Methodology for the 5-Year OCS Oil and Gas Leasing Program for 2012-2017. BOEM OCS Study 2011-050.

I. Standard of Review

The components and methods of a rigorous net public benefits analysis relevant to OCS leasing decisions are well established by professional best practices and the statutes, regulations, rules and guidance governing federal natural resource policy in general and BOEM in particular. Before we highlight areas of concern with respect to the NPB analysis and economic impact discussions included in the proposed Program and DPEIS, we summarize the standard of review established by these sources.

Net public benefits analysis – best practices

One way to determine whether policies, programs, and projects adopted by public agencies are in the public interest is to evaluate their costs and benefits. Typically, such programs must demonstrate that they maximize net public benefits rather than simply private financial benefits to landowners or commercial interests. Demonstrating whether or not net public benefits (i.e., social benefits in excess of social costs) exist is, in turn, established by undertaking a benefit-cost analysis (BCA). The basic techniques of BCA in public policy settings are well understood.

There are nine basic steps: (1) specifying the set of alternatives including no action; (2) deciding whose benefits and costs are included; (3) cataloguing the impacts and selecting measurement indicators; (4) predicting impacts quantitatively over the analysis period; (5) assigning monetary values to all significant impacts; (6) discounting benefits and costs to obtain present values; (7) computing the net present value (NPV) and benefit cost ratio of each alternative; (8) addressing risk and uncertainty including sensitivity analysis, and (9) making recommendations based on NPV, the benefit cost ratio, and sensitivity analysis.[5]

For each of these steps, there is a set of core principles that define best practices and maximize the robustness of the BCA as applied in any particular policy situation.[6] For purposes of this critique, some of the most relevant principles include:

1. "*With and without" framework*: The economic feasibility of a proposed policy, program, or project is established by modeling the stream of benefits and costs with and without the action in the same manner using the same analytical techniques.

2. *Comprehensiveness*: A robust BCA should incorporate benefits and costs enjoyed and incurred by all affected interests, whether they be private or public entities, and the

[5] See, e.g. Boardman, Anthony E., David H. Greenberg, Aidan Vining, and David L. Wiemer. 2001. *Cost-Benefit Analysis: Concepts and Practice*. Upper Saddle River NJ: Prentice Hall.

[6] See, e.g. Boardman et al. (2001), note 5; Freeman, A. Myrick. 1993. The Measurement of Environmental and Resource Values. Washington, D.C.: Resources for the Future; Ofiara, Douglas D. and Joseph J. Seneca. 2001. Economic Losses from Marine Pollution – A Handbook for Assessment. Washington, D.C.: Island Press; Water Resources Council. 1983. Economic and Environmental Principles for Water and Related Land Resources Implementation Studies. Washington, D.C.: Water Resources Council.

likely changes in renewable and non-renewable resource values regardless of whether the source of these values is market, non-market, use or non-use in nature.

3. *Consumer surplus as the basis for benefit calculations*: Society's willingness to pay (WTP) for policies, programs, or projects is the basis for benefit calculations. This is best approximated by changes in consumer surplus.

4. *Accounting for externalities:* Externalities, such as those that arise from increases in air and water pollution, must be accounted for using well-established techniques for assessing the public health and environmental costs of natural resource damages.

5. *Provincial geographic scope*: When BCA is used to inform public decision makers, the proper geographic scope includes all interests within the jurisdictional boundaries of the agency in question, a "provisional" scope that is often established by statute, regulation, or rule.

6. *Incorporating both economic and institutional sources of risk and uncertainty*: In conducting sensitivity analysis it is critical to address all significant sources of risk and uncertainty including economic (i.e., prices, costs, discount rates) and institutional such as policy interventions that affect supply and demand over the analysis period.

Net public benefits analysis – regulatory framework applicable to BOEM

Taken together, the statutes, regulations, and regulatory guidance applicable to BOEM and the leasing program establish the framework for a net public benefits analysis to justify decisions that incorporates all of the specific steps and principles for BCA summarized above. While a detailed examination of this regulatory framework is beyond the scope of this report, here, we summarize a few of the most salient provisions:

Section 18 of the Outer Continental Shelf Lands Act (OCSLA)

Section 18 of OCSLA requires that BOEM conduct the Program "in a manner which considers economic, social, and environmental values of the renewable and nonrenewable resources contained in the OCS and the potential impact of oil and gas exploration on other resource values of the OCS and the marine, coastal, and human environments."[7] Along with this broad mandate to comprehensively address resource values, OCSLA requires balancing of development benefits and risks between regions and receipt of fair market value for leased lands.[8] Courts have weighed in on the analytical methods BOEM relies on to fulfill these obligations by endorsing the use of benefit-cost analysis and by requiring quantification of environmental externalities to the extent practicable and objective analysis in support of net economic value determinations.[9]

[7] 43 U.S.C. § 1344 (a) 1.
[8] 43 U.S.C. § 1344(a)(2)(B), (C), & (D); (4).
[9] *California v. Watt*, 688 F2d 1290 (D.C. Cir. 1981).

National Environmental Policy Act (NEPA) and its implementing regulations

NEPA and its implementing regulations require preparation of an environmental impact statement (EIS) for all major federal actions significantly affecting the quality of the human environment.[10] Direct, indirect, and cumulative effects that must be considered include ecological, aesthetic, historic, cultural, economic, social, and health.[11] To the extent economic effects are considered, NEPA includes a mandate to ensure that "presently unquantified environmental amenities and values are given appropriate consideration in decisionmaking along with economic and technical considerations."[12] Alternatives, including no action must receive rigorous and objective examination.[13] To the extent that BCA is used as an aid in decision-making, NEPA regulations specify procedures for incorporating the BCA into the EIS and discussing its relationship to unquantified environmental impacts, values, and amenities.[14]

OMB Circular A-94

Office of Management and Budget (OMB) circular A-94 requirements "apply to any analysis used to support government decisions to initiate, renew, or expand programs or projects which would result in a series of measurable benefits or costs extending for three or more years into the future."[15] A-94 establishes net public benefits as the basis for decision-making, benefit cost analysis as the methodology, net present value as the essential metric, and a comprehensive accounting of all social benefits and costs and consumer surplus as the basis for benefit estimates.[16]

A-94 also directs federal agencies to limit NPB analyses to a provincial analysis of effects on citizens of the United States and requires consideration of externalities, monetization of all benefits and costs to the extent practicable, treatment of uncertainty through the use of expected values, and analysis of the no action alternative as a basis of comparison with proposed actions.[17] In its Program documentation, BOEM acknowledges that A-94 is applicable to its NPB analysis.[18]

Executive Orders 13563 and 12866

Executive Order 12866 (1993) mandates a social benefit-cost test for regulations and regulatory review. Executive Order 13563 (2011) refines this mandate. They direct

[10] 42 USC § 4332 (C); 40 CFR § 1502.3.
[11] 40 CFR § 1508.8.
[12] 42 USC § 4332 (B).
[13] 40 CFR § 1502.14.
[14] 40 CFR § 1502.23.
[15] Office of Management and Budget (OMB), Circular A-94 (Revised), Available at: http://www.whitehouse.gov/omb/circulars/a094/a094.html.
[16] OMB Circular A-94, note 15, Sections 5; 5(a); 6 and 6(b) 1.
[17] OMB Circular A-94, note 15, Sections 5(a); 5(c) 3; 6; 6(a) and 9.
[18] BOEM (2011c), note 4 at 25.

agencies to assess all costs and benefits of available regulatory alternatives and, if regulation is necessary, to select regulatory approaches that maximize net benefits including potential economic, environmental, public health and safety, and other advantages; distributive impacts; and equity.[19] In making net benefits determinations, agencies are directed "to use the best available techniques to quantify anticipated present and future benefits and costs as accurately as possible."[20]

Executive Order 12893

Executive Order 12893 (1994) applies to federal spending for infrastructure programs including direct spending and grants for transportation, water resources, energy, and environmental protection. To the extent that onshore or offshore energy infrastructure vital to the Program will be assisted by federal spending through various cost share or grant programs, E.O. 12893 requirements apply.[21] Even without direct applicability, E.O. 12893 establishes useful guidelines for economic analysis that extend to all federal policies, programs, and projects.[22] These include a systematic consideration of benefits and costs, monetized to the maximum extent practicable. All types of benefits and costs, both market and non-market, should be considered. A full suite of alternatives, including management of demand should be considered. Externalities borne by the public must be included in the analyses. To the extent that streams of benefits and costs over time are uncertain, agencies are directed to address such uncertainty through appropriate quantitative and qualitative assessments.

II. Critique

Based on the standard of review established by regulatory requirements and best professional practices, CSE undertook a review of the NPB analysis supporting the Program and the DPEIS. We identified five major areas of concern. These include:

1. The DPEIS and NPB present a biased characterization and analysis of the no action alternative that works to significantly understate its economic and social value.

One of the critical components of a rigorous NPB analysis is an objective evaluation of the "without" scenario, in which the policy, program or project does not occur, in order to provide a solid point of reference against which proposed actions may be compared. The without-project scenario is the "most likely condition expected to exist over the planning period in the absence of the plan, including any known change in law or policy."[23] The without project scenario is synonymous with the no-action alternative required by NEPA:

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[19] Executive Order 13563, Section 1(b) 3.
[20] Executive Order 13563, Section 1(c).
[21] Indeed, the BOEM itself provides grant funds for energy infrastructure projects that facilitate OCS leasing. For examples, grants announced in March of 2011 included roadway improvement projects in coastal Louisiana deemed critical to OCS activities. See: http://www.boemre.gov/ooc/press/2011/press0307b.htm.
[22] Executive Order 12893 Section (a) 1-5.
[23] See, e.g. WRC (1983), note 6 at 2.7.3 (a).

"[t]he without-plan condition is the condition expected to prevail if no action is taken."[24] To provide a valid point of reference, the without or no action alternative considered in both NPB and NEPA analyses must be analyzed with the same level of detail given to the action alternatives "to avoid any indication of a bias towards a particular alternative(s)."[25] Courts have consistently found that federal agencies must conduct "informed and meaningful" analysis of all alternatives, including no action, and to specifically address how the no action alternative affects environmental impacts and the cost-benefit balance.[26]

There are several sources of bias included in both the NPB analysis and DPEIS that work to significantly understate the economic benefits of the no-action alternative. These deficiencies include the failure to address the benefits of no action, an overly simplistic division of the costs of no action that serves to overstate those costs in the Alaska regions, and the failure to include option value. These issues are discussed below.

a. Costs are addressed, but not benefits.

To be complete, NPB analyses must assign monetary values to both costs and benefits of each alternative under consideration. While this seems intuitive, BOEM's NPB analysis only describes the no action alternative in terms of costs. According to the agency, one of the key economic benefits of the proposed Program is the avoided environmental and social costs associated with the forecasted energy mix that would replace foregone oil and gas development under the no action (no sale) option. The theory is that without an OCS leasing program, energy demand would be met from substitute sources including onshore oil and gas production (17% of the required substitution), imports (67%), coal (6%), electricity from non-fossil sources (3%), other energy sources (2%) and reduced demand (6%).[27]

This mix, under BOEM's reasoning, has higher environmental and social costs than the mix associated with the proposed Program. According to the NPB analysis, such costs "mostly come from the risk of oil spills and air emissions from additional tanker imports and greater air emissions resulting from increased onshore production of oil, gas, and other energy substitutes such as coal." Putting aside any critique of the reasoning here,[28] these costs are the only economic value assigned to the no action alternative – any benefits are neglected altogether. BOEM subtracts these costs from any environmental and social costs of the proposed Program to understand its net effects. By doing so, the proposed Program is transformed from one that generates $3.98 to $7.51 billion in environmental and social

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[24] See, e.g. WRC (1983), note 6 at 1.4.9 (a).

[25] U.S. Department of Transportation, Federal Highway Administration, NEPA and Transportation Decision Making, viewable at: http://environment.fhwa.dot.gov/projdev/tdmalts.asp.

[26] See, e.g. *Bob Marshall Alliance v. Hodel*, 852 F.2d 1223, 1228 (9th Cir. 1988); *Alaska Wilderness Recreation and Tourism Association v. Morrison*, 67 F.3rd 723, 729-30 (9th Cir. 1995).

[27] BOEM (2011c), note 4, Table 2 at 15.

[28] For example, since some of the OCS oil and gas would also have to be transported, via tankers, to port from offshore rigs, the risk of tanker spills is not eliminated, but reduced. BOEM's final analysis should attempt to quantify this since the assumption of greatly reduced spills in the action alternatives is so important.

costs into one that yields $3.10 to $10.70 billion in net environmental and social benefits.[29] Had benefits of no action been estimated, the math would work out very differently, and so failure to include these benefits introduces a serious source of bias into the NPB calculations.

This same biased characterization of the no action alternative is repeated and amplified in the DPEIS. The DPEIS discusses a wide range of negative environmental impacts associated with the energy mix associated with the no action alternative, including increases in oil spills, acid mine drainage, contamination of ground and surface water, and emissions of NOx, SOx, and PM from coal combustion.[30] In terms of socio-economic and socio-cultural effects, BOEM finds that "[t]he No Action Alternative would result in reduced employment and income opportunities and potentially could affect the stability and cohesion of communities and cultures."[31] The DPEIS also asserts that the no action alternative could "result in situations in which local infrastructure and populations could not be maintained, resulting in out-migration and a reduction in public services."[32] As with the NPB analysis, there is no counterbalancing discussion of benefits.

To meet the standards for objectivity and balance, a range of benefits associated with the no action alternative should be described, quantified, and monetized to the extent practicable in both the NPB analysis and DPEIS. Such benefits fall into two basic categories: (1) avoided costs, as those described for the Proposed program, and (2) a wide range of use and non-use values associated with lands and waters affected by OCS activities.

With respect to avoided costs, all of the environmental and social costs associated with the proposed Program should be included since the action alternatives all take the environmental and social costs associated with no action into account.[33] They also would include the avoided costs associated with reduced fossil fuel consumption, since in the no action case, the presumption is that demand reduction would account for six percent of the energy mix made up for in the absence of the Program. These would include reduced air and water quality impacts, reduced spills, reduced carbon emissions damage, and fiscal savings associated with reduced consumption and production subsidies.

There are other benefits that stand alone, irrespective of costs avoided. These benefits are associated with the flow of goods and services associated with both active uses and passive non-uses of ecosystems in their unaltered, undeveloped state that could be affected by OCS activities. According to the DPEIS, both on-shore and offshore ecosystems affected include wetlands, estuaries, seagrass and kelp beds, mangroves, dunes, beaches, barrier islands,

[29] To further illustrate the calculation: $7.51 billion is the expected environmental and social cost price tag for the high price scenario across all planning areas. The environmental and social cost of the no action alternative is estimated to be $18.21 billion. Subtracting this from $7.51 billion yields -$10.70. Since this is a "negative" cost, it is reported as a net Program benefit. See BOEM (2011c), note 4, Table 3.
[30] DPEIS at 4-497 to 4-499.
[31] DPEIS at 4-499.
[32] DPEIS at 4-500.
[33] Program at Table 16, page 108.

open water habitats and seafloor habitats.[34] Economists have coined the term "ecosystem services" to describe the diverse economic benefits that these ecological communities provide. Ecosystem services are generally classified into four major categories:[35]

- Provisioning services are the goods or products obtained from ecosystems such as food, medicinal plants, freshwater and fiber. These services are tangible and many—but not all—are often tradable and priced in the marketplace.
- Regulating services are the benefits obtained from an ecosystem's control of natural processes such as carbon sequestration, erosion control, flood control, and pollination.
- Cultural services are the nonmaterial benefits obtained from an ecosystem such as recreation, scenic and aesthetic enjoyment, and spiritual renewal.
- Supporting services are natural processes—such as nutrient cycling, primary production, and water cycling—that maintain the other ecosystem services.

These ecosystem services have values that can be measured by economists using a range of peer-reviewed methodologies well established in the literature.[36] Many of the ecosystem types affected by the Program have been addressed.[37] BOEM also has at its disposal a range of existing studies that report ecosystem service values for specific geographic areas affected by proposed OCS leasing activities and for specific resources, such as threatened and endangered species and marine mammals. For example, a recent Earth Economics analysis found that "Mississippi River Delta ecosystems provide economically valuable services including hurricane storm protection, water supply, climate stability, food, furs, habitat, waste treatment, and other benefits worth at least $12-47 billion/year."[38]

The importance of addressing passive use values was recently underscored by NOAA as part of the critical habitat designation process for the Cook Inlet beluga whale: "[p]assive use value to society of critical habitat designation reflects the increased well-being obtained from the knowledge that Cook Inlet beluga whales persist *within their natural habitat in Cook Inlet*. Society would not derive the same level of well-being (i.e., would not have an equivalent WTP) for a remnant population of Cook Inlet beluga whales being kept in an artificial environment, such as an aquarium tank at the Port of Anchorage" (italics in original).[39]

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[34] DPEIS at 1-14 to 1-15.

[35] Millennium Ecosystem Assessment. 2005. Ecosystems and Well-Being. Volume 1: Current State and Trends. Findings of the Condition and Trends Working Group. Washington D.C.: Island Press.

[36] For a summary of various techniques including contingent valuation, choice experiments, hedonic pricing, travel cost, avoided cost, replacement cost and the productivity method see Raheem, N., J. Talberth, S. Colt, E. Fleishman, P. Swedeen, K.J. Boyle, M. Rudd, R.D. Lopez, T.O. Higgins, C. Willer and R.M. Boumans. 2009. The Economic Value of Coastal Ecosystems in California. Sacramento: Ocean Protection Council.

[37] Raheem et al. (2009), note 36, Table 2 at 25-27.

[38] Batker, D., I. de la Torre, R. Costanza, P. Swedeen, J. Day, R. Boumans and K. Bagstad. 2010. Gaining Ground: Wetlands, Hurricanes, and the Economy – The Value of Restoring the Mississippi Delta. Tacoma, WA: Earth Economics.

[39] NOAA Fisheries Service. 2010. Final RIR/4(b)2 Preparatory Assessment/ FRFA for the Critical Habitat Designation of Cook Inlet Beluga Whale. Anchorage: U.S. Department of Commerce, National Oceanic and Atmospheric Association, Fisheries Service Alaska Region at 5-7.

Passive use values for at risk species and the magnitude of losses associated with projects that put these species at risk can be empirically measured, primarily through contingent valuation surveys. A recent meta-analysis of a set of 29 U.S. studies found annual household willingness to pay values for actions to protect threatened and endangered species to range from $11 to $350 in 2006 dollars.[40] Many of these studies have addressed marine mammals affected by proposed OCS leasing activities. NOAA cites a WTP range of $16.18 to $142 per household per year for a range of U.S. studies addressing a wide variety of species.[41]

Given that ecosystem service values are substantial, measurable, and to at least some extent already estimated for lands, waters, and species affected by OCS leasing activities, their conspicuous absence from the DPEIS discussion or NPB analysis of the no action alternative introduces a substantial source of bias against its selection.

b. The costs of the no action alternative are unjustifiable in the three Alaska planning areas.

In the Cook Inlet, Beaufort Sea, and Chukchi Sea planning areas, BOEM estimates the combined environmental and social costs of the no action alternative to range between $150 million to $4.6 billion across the three oil price scenarios. These values are 7.5 to 77 times greater than the environmental and social costs of the Program as presented in Table 3 (page 17) of the net benefits analysis document. As previously noted, BOEM attributes these costs to the risk of oil spills and air emissions from additional tanker imports and greater air emissions resulting from increased onshore production of oil, gas, and other energy substitutes such as coal.

However, very little if any of this activity is likely to occur in the three Alaska planning areas – for example, nearly all U.S. oil imports are taken in by East and Gulf Coast ports. The only reason these no action cost figures are so large in Alaska is because BOEM uses a simplistic method to apportion such costs amongst the OCS planning areas. According to the Program documentation, "the costs of the energy alternatives or substitutions are proportionally spread among the different program areas based on the amount of production expected from each area in the exploration and development scenarios."[42] As a result, Alaska planning areas are assigned up to $4.6 billion in no action alternative costs even though the vast majority of these costs would not actually be incurred within these planning areas. Needless to say, this introduces yet another significant source of bias against selection of the no action alternative, at least with respect to Alaska.

[40] Richardson, Leslie, and John Loomis. 2009. "The total economic value of threatened, endangered, and rare Species: an updated meta-analysis." *Ecological Economics* 68: 1535-1548.
[41] NOAA (2010), note 39 at A-10 – A-11.
[42] Program at 102.

c. The role of conservation and efficiency in reducing future demand appears to be substantially underestimated.

One critical assumption backing BOEM's cost estimates for the no action alternative is the assumption that demand reduction will account for just 6% of the substitutes for OCS oil and gas if the Program is not authorized. This figure is derived from the results of the MarketSim model for the mid-price scenario.[43] The detailed technical data and forecasting methods behind this figure have not been disclosed as part of the public record, and so it is impossible to comment on its validity. Nonetheless, there are two questionable aspects of BOEM's use of this figure in its analysis.

First, the 6% figure is used as a basis for analysis in all three oil price scenarios, which implies that demand reduction is insensitive to price. Historical data do not bear this out. For example, during the 2008 oil price spike, demand reduction was considerable. The combination of oil prices hitting a record $147 per barrel and a slowing economy prompted a 1.2 million barrel per day contraction in U.S. consumption of petroleum products, the largest decline since 1980 at the climax of the 1979 energy crisis.[44]

To put this into perspective, this level of demand reduction translates into an annual reduction of 438 million barrels. Over the 50-year analysis period for the Program, this would represent a reduction of over 21.9 billion barrels – a value that is 2.7 times larger than the entire OCS production estimate for the 2012 – 2017 Program (8.13 billion barrels, excluding gas). Thus, consumers, acting on their own through modest conservation measures, could easily replace 100% of the oil produced by the Program should the no action alternative be selected. At very least, this calls into question use of the 6% figure in the high price ($160 per barrel) scenario when historical data suggest a much greater response to prices well below that level.

Second, the 6% figure does not take into account the effects of technological innovation (i.e., efficiency improvements) and policy interventions over time. While 6% may or may not be a realistic figure in the short term, clearly, long run policy aspirations are far greater. For example, In July 2011, President Obama and 13 automakers accounting for 90 percent of the domestic market agreed to increase corporate average fuel efficiency standards annually to average 54.5 miles per gallon by 2025– roughly a 100% increase over 2011 levels.[45] BOEM's documentation of the MarketSim model provides no indication that significant policy interventions such as this were factored into the analysis.

Since the forecasted environmental and social costs of the no action alternative are highly dependent on the assumption that just 6% of OCS oil produced by the Program would be

[43] BOEM (2011c), note 4 at 15.
[44] Energy Information Administration. 2009. Short Term Energy Outlook – February 2009. Washington, D.C.: EIA.
[45] National Highway Traffic Safety Administration. 2011. "President Obama Announces Historic 54.5 mpg Fuel Efficiency Standard". Available at http://www.nhtsa.gov/About+NHTSA/Press+Releases/2011/President+Obama+Announces+Historic+54.5+mpg+Fuel+Efficiency+Standard.

compensated for by demand reduction, the fact that this figure may be far off the mark represents a potentially significant source of bias against no action.

d. The DPEIS fails to discuss option value.

Option value is a significant, source of economic benefit associated with deferring extraction of non-renewable resources. One aspect of option value is associated with the value of waiting for better information about prices and costs when projections are highly speculative or subject to extreme variations. For example, the NPB analysis is based on three oil price scenarios ranging from $60 to $160 per barrel – an extremely large range that has profound consequences on Program economics depending on which scenario is analyzed. In such cases, there are efficiency gains associated with waiting – i.e., no action – that benefit society by reducing the possibility of allocating resources to extraction activities that prove not to be cost effective. The Institute for Policy Integrity (IPI) completed a useful analysis of why this aspect of option value should be included in BOEM's NPB analysis.[46] At minimum, the information presented by IPI should be incorporated into the DPEIS discussion of no action alternative benefits in order to help balance a discussion that is now solely limited to costs.

Another specific type of option value – bequest value – is also relevant to OCS leasing activities. Bequest value is an important consideration in optimizing the allocation of scarce non-renewable resources over time to foster greater intergenerational equity.[47] It is based on the fact that the present generation derives utility (or benefit) from deferring consumption of a non-renewable resource today in order to help sustain quality of life for subsequent generations.[48] Given the forecasts of peak oil, coal, and natural gas production over the next several to twenty years,[49] bequest values associated with OCS oil reserves can be significant and so warrant discussion as another category of benefit associated with the no action alternative in the DPEIS.

2. Program benefits are substantially exaggerated.

Below, we discuss three problematic aspects of the NPB analysis that work to substantially overstate Program benefits. These are (a) the inclusion of private industry profits, (b) questionable assumptions about the effects of OCS supplies on prices, and (c) the inclusion of foreign consumer surplus. In the table presented in the conclusion, we demonstrate the potential significance of correcting two of these problematic aspects ("a" and "c"). Taken together, they alone may account for $31 - $227 billion in Program benefits that ought not to be counted. Given the magnitude of the potential error, at minimum, BOEM should

[46] Institute for Policy Integrity. 2011. The BP Gulf Coast Oil Spill, Option Value, and the Offshore Drilling Debate. New York: IPI, New York University School of Law.
[47] See, e.g. Klepper, Gernot. 1995. Sustainability and Intergenerational Transfers. Kiel Working Paper No. 683. Kiel: The Kiel Institute of World Economics.
[48] Boardman et al. (2001), note 5 at 216.
[49] For an in depth discussion of the economic consequences of rapid depletion of fossil resources, see Heinberg, Richard. 2011. The End of Growth: Adapting to Our New Economic Reality. Gabriola Island, BC: New Society Publishers.

provide a detailed explanation and justification as to why these benefit categories were included despite their obvious inconsistency with the basic principles of net public benefits analysis.

a. The NPB analysis inappropriately includes industry profits.

Oddly, a major share of net public benefits reported in BOEM's analysis is represented by industry profits. Under the various alternatives considered, industry profits – reported as net economic value (NEV) – represents 47% of reported net benefits in the low price scenario and over 78% in the high scenario.[50] According to BOEM, NEV is "[t]he profit available to be shared by the oil industry and the government from producing the public resources made available by the program."[51] The reference to government profit is superfluous, as it assumes some future transfer of industry profit by way of royalties and taxes that is not part of the NEV calculation.

Including private profits in a net public benefits analysis is inconsistent with both professional and legal standards. The basis for benefit calculations in a public policy setting is consumer surplus, which is a proxy for society's willingness to pay for a policy change. It is the social benefits that matter in a NPB analysis, not private gain. As Boardman (2001) notes, "under most circumstances changes in consumer surplus can be appropriately used as reasonable approximations of society's willingness to pay for a policy change."[52] This concept is echoed in Circular A-94. According to A-94, "[t]he economist's concept of consumer surplus measures the extra value consumers derive from their consumption compared with the value measured at market prices. When it can be determined, consumer surplus provides the best measure of the total benefit to society from a government program or project."[53]

The Circular also distinguishes between social and private (or market) benefits, noting that including the latter in calculation of net public benefits is unwarranted due to several market distortions including external economies or diseconomies, monopoly power, taxes, and subsidies.[54] The existence of such distortions creates a disconnect between private gains and social benefits and so precludes use of private market benefits in a social benefit-cost framework.

Even if BOEM could rationalize the inclusion of industry profits in its NPB analysis, clearly, the inclusion of profits that are enjoyed by foreign entities must be excluded. One of the basic principles guiding NPB analysis by federal agencies is that the scope is limited to benefits enjoyed or costs incurred by the American people. A portion of the NEV included in BOEM's analysis, however, will be enjoyed by foreign leaseholders. Presently, there is no easy way to predict what this share will be over the life of the Program. Nonetheless, what

[50] BOEM (2011c), note 4, Tables 1 and 5.
[51] BOEM (2011c), note 4 at 7.
[52] Boardman et al. (2001), note 5 at 51.
[53] OMB Circular A-94, note, 15 at Section 6(b)1.
[54] OMB Circular A-94, note, 15 at Section 6.

data and analysis do exist indicate that the share is likely to be substantial. For example, and as discussed in detail in Appendix 3, over 87% of the acreage associated with existing leases in Alaska OCS waters is held by foreign companies (Table A3-1). Foreign held companies are ubiquitous bidders in the Gulf of Mexico (Table A3-2). So again, even if the NEV line item is retained by BOEM in its final NPB analysis, at minimum, the substantial (in all likelihood) share of NEV that will be generated by foreign owned entities must be subtracted.

b. Price effects are suspect, and do not comport with the reality of the U.S. as a price taker.

A major assumption in the NBP analysis is that the supply of oil and gas from OCS lands will reduce the price of final consumption and therefore generate consumer surplus benefits in the order of $23.1 to $47.3 billion for the proposed action under low and high oil price scenarios.[55] In particular, these benefits are described as the "implicit pecuniary benefits afforded consumers in the form of reduced oil and gas prices generated by the incremental oil and gas supplied from the program."[56] While neither the Program documentation nor the economic analysis methodology provides details of the MarketSim model used to derive benefit values of consumer surplus, the magnitude of consumer surplus attributable to oil supplied by the Program is suspect given the reality that the United States is a price taker (i.e. it cannot directly influence prices by way of its supply) in international oil markets. The consumer surplus estimates associated with natural gas are more plausible because the United States produces a sizable portion of the global total and nearly the same amount that is consumed domestically.

In evaluating BOEM's assumptions, one must consider the global markets for oil. The U.S. Energy Information Administration (EIA) lists seven factors affecting crude oil prices, including: (1) non-OPEC supply; (2) OPEC supply; (3) balance (i.e., status of countries' inventory); (4) spot prices; (5) financial markets and their speculation; (6) non-OECD demand, and (7) OECD demand.[57] Changes in these factors, especially due to rising demand from Asian countries and resulting falling demand as a result of the global economic downturn, caused significant price volatility in crude oil markets for the last decade.

U.S. demand is a significant factor in oil prices, but domestic supply has a negligible effect. In 2010, the United States consumed 19,180 thousand barrels per day, exceeding combined demand from the next four leading countries (i.e., China, Japan, India, Russia).[58] However, U.S. production in 2010 was relatively small at 7.4 percent of the world total.[59] In addition, U.S. proved reserves comprised just 1.5 percent of the world total in 2009, the last year for

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[55] Program Table 16 at 108.

[56] BOEM (2011c), note 4 at 7.

[57] U.S. Department of Energy, Energy Information Administration. 2012. "What drives crude oil prices?" Available at http://www.eia.gov/finance/markets/.

[58] U.S. Department of Energy, Energy Information Administration. 2012. Countries data. Available at http://www.eia.gov/countries/index.cfm.

[59] U.S. Department of Energy, Energy Information Authority. 2012. Production of Crude Oil including Lease Condensate and Crude Oil Proved Reserves.

which data is available.[60] The combined effect of large U.S. demand as a share of global demand and minor U.S. production as a share of global production leads to negligible price benefits from increased domestic production.

For example, the EIA concluded in 2008 that the high resource case for opening the Arctic National Wildlife Refuge (ANWR) would generate 4.3 billion barrels of oil in the 12 years between 2018 and 2030. Such production would account for 1.2 percent of total world consumption in 2030 and "is not projected to have a large impact on world oil prices."[61] Comparatively, full production of all leases in the OCS program total 8.3 billion barrels over a 40 to 50 year time frame. If little price effect was predicted by EIA for ANWR it should follow that even less impact could be expected from OCS oil because of its relatively lower annual production levels.

c. The NPB analysis fails to account for exports of petroleum products refined from OCS oil.

Another problematic aspect of BOEM's consumer surplus benefit estimates is the failure to account for U.S. exports of petroleum products refined from OCS oil. According to the NPB analysis, the MarketSim model assumes that OCS oil will lead to an "outward shift in the supply function" within the primary oil and gas markets.[62] This, in turn, generates consumer surplus gains associated with greater consumption at lower prices for those products. Subsequently, demand declines for secondary energy market substitutes including coal. Reduced demand in the secondary market generates another round of consumer surplus gains associated with lower prices for those substitutes.

The analysis assumes that the initial supply shock is confined within U.S. borders. BOEM states this explicitly: "this Net Benefits analysis is confined to a national, U.S. perspective."[63] It is also reflected implicitly in the fact that under the no action alternative, the NPB analysis assumes that American consumers will substitute OCS oil and gas that would otherwise be made available with increased imports from abroad, various domestic sources, and demand reduction. The substitutions account for 100% of OCS production and so clearly the model assumes that all final products will be consumed domestically.[64]

The problem, however, is that a substantial portion of final petroleum products refined from OCS oil will be exported. While exports of crude oil products from OCS lands are for the most part prohibited, there are no such restrictions on the final consumer products.[65] And in recent years, the United States has become a major exporter. This fact was recently

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[60] U.S. Department of Energy, Energy Information Administration. 2012. Oil and Gas Supply, Reference case.
[61] U.S. Department of Energy (DOE1). Energy Information Administration. 2012. Analysis of Crude Oil Production in the Arctic National Wildlife Refuge. Available at http://205.254.135.7/oiaf/servicerpt/anwr/results.html.
[62] BOEM (2011c), note 4 at 18-19.
[63] BOEM (2011c), note 4 at 17.
[64] BOEM (2011c), note 4, Table 2 at 15.
[65] Except for limited circumstances discussed in OCSLA, crude exports from OCS waters are prohibited by the Export Administration Act of 1969 (50 App. U.S.C. 2401 et seq.).

underscored by the Los Angeles Times in November of 2011: "U.S. exports of refined fuels, particularly diesel, have surged to fresh all-time highs, helping to keep the prices of gasoline and diesel in this country at record levels for this time of year… Exports of U.S. refined fuels are expected to increase, with global demand projected to rise sharply in the coming years."[66] In fact, in late 2011 the United States hit an historical milestone by becoming a net exporter. This trend has continued into 2012. For the week ending 1/20/12, the U.S. Energy Information Administration reports that the United States exported an average of 2,884,000 barrels of final petroleum products per day while importing only 2,201,000.[67]

The implications for this on BOEM's analysis are substantial. It means that the assumed initial domestic supply shift associated with OCS production may be overstated by 50% or more since a major portion—if not the majority—of final products refined from OCS oil will be exported. Although difficult to determine without access to the MarketSim model, domestic consumer surplus benefits are probably overstated by a comparable amount. In the final NPB analysis, BOEM can correct this in one of two ways: (1) either deduct from its consumer surplus benefit estimates the amount of consumer surplus enjoyed by foreign consumers,[68] or (2) correct the magnitude of the initial domestic supply curve shift. Either way, the final consumer surplus estimates will be substantially lower than those now reported.

3. Program costs are substantially underestimated.

    a. Costs included in the NPB analysis do not include public financial costs borne by federal, state, and local governments.

Throughout the United States, and globally, public financial support – or subsidies – for fossil fuels has received extensive criticism as an impediment to the renewable energy transition and an unnecessary fiscal burden borne by governments at every level. Nonetheless, neither the NPB analysis nor DPEIS address these costs. In its most recent *World Energy Outlook*, the International Energy Agency (IEA) warns that global fossil fuel subsidies could top $660 billion by 2020 without reforms.[69] A new report issued jointly by the IEA, Organization of Petroleum Exporting Countries (OPEC), Organization for Economic Cooperation and Development (OECD), and World Bank considered 250 individual mechanisms that effectively support fossil-fuel production or consumption in the 24 OECD

[66] White, Ronald. 2011. "Fuel exports hit record, helping keep gas prices high in U.S." *Los Angeles Times*, November 12. Available at: http://articles.latimes.com/2011/nov/12/business/la-fi-fuel-exports-20111112.
[67] U.S. Energy Information Administration, Weekly Imports and Exports of Petroleum and Other Liquids. Available at: http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=WRPIMUS2&f=W.
[68] This is a more complex route, since it would involve forecasting the effects of OCS oil supplies on several domestic markets, or globally.
[69] International Energy Agency. 2011. World Energy Outlook 2010. Paris: OECD/ IEA.

countries, which includes the United States. These mechanisms were estimated to have an aggregate value in the order of $45-$75 billion per year over the 2005-2010 period.[70]

In the United States, there are varying estimates of the magnitude of public financial support for fossil fuel production depending on which specific programs are considered. Four high-profile studies of federal oil and gas financial assistance programs since 1998 contain 33, 14, 19, and 31 programs, respectively (Appendix 2, Annex 1). In Appendix 2, we report OECD's estimate of the annual average value of support for oil in the United States to be $4.57 billion for petroleum products and $5.38 billion for natural gas.

We then convert this figure into a minimum cost of $1.16/ bbl-equivalent for natural gas and $2.41/ bbl for oil, which translates into nearly $13.27 billion in present value costs over the life of the Program under the high price scenario. Its value relative to the NPB calculations for the entire program suggest that excluding this factor represents a significant source of bias that should be remedied in BOEM's final Program analyses.

b. Loss of ecosystem service values associated with disturbance of marine and terrestrial ecosystems are excluded.

An important, and commendable, aspect of BOEM's NPB analysis is the inclusion of monetized values for environmental externalities associated with oil spills, air emissions and marine infrastructure. BOEM's Offshore Environmental Cost Model is (OECM) is used as a basis for cost estimates which range from $3.99 to $7.50 billion for the proposed action and $7.08 to $18.21 for the no action alternative.[71] As discussed in Section 1(a) above, the model assumes that the no action alternative is the costliest because it emphasizes costs associated with spills and assumes that the risk of spills (largely from oil imports) is greatest under this alternative.

As we also noted in Section 1(a), there is a major omission in the NPB analysis of the no action alternative – it reports costs, but not benefits. These benefits are generated by a diverse array of ecosystem services provided by marine and terrestrial ecosystems affected by OCS leasing activities in their undisturbed state, and ought to be included. As a corollary, the reduction in these ecosystem service benefits should be counted as a Program cost.

So, for example, the DPEIS acknowledges that OCS leasing activities and associated infrastructure will cause the loss and degradation of coastal wetlands both directly through pipeline construction and navigation channels and indirectly through "decreased water quality (such as from disposal of OCS-related wastes), altered hydrology, and vessel traffic."[72] Such losses can, and have been quantified with peer-reviewed methods available to BOEM. For example, Earth Economics recently estimated the ecosystem service values of

[70] Organization for Economic Cooperation and Development. 2011. Inventory of Estimated Budgetary Support and Tax Expenditures for Fossil Fuels, [www.oecd.org/g20/fossilfuelsubsidies], Paris, OECD Publishing.
[71] Program, Table 16 at 108.
[72] DPEIS at 4-170.

a variety of Gulf Coast wetlands to range between $2,760 and $12,630 per acre per year.[73] When wetlands are lost, this imposes an equivalent magnitude of costs on society. Even if the benefit stream from the same wetlands affected were included in the analysis of no action alternative benefits, they should be counted here as a loss since each alternative needs to stand on its own with respect to benefits generated and costs incurred. These losses should be incorporated into the NPB analysis, as should losses of other important ecosystem service values including passive uses associated with marine mammals and other threatened, endangered, and sensitive species adversely affected by the Program.

c. Carbon emissions damage associated with both production and final consumption are excluded.

Perhaps the most significant externality omitted from the NPB and DPEIS are the costs associated with carbon emissions. While direct emissions from OCS leasing activities are quantified in the DPEIS, they are not incorporated into the NPB analysis as a social cost despite well-established methods for doing so and a mandate to monetize externalities to the maximum extent practicable.[74] Carbon emissions associated with final consumption of OCS derived fossil fuel products are not considered at all, ostensibly, because such emissions and associated impacts on climate change have no bearing on decisions affecting the OCS leasing program.[75]

The latter omission strongly biases the economic analysis and thus the decision making process because the benefits of final consumption are included. In particular, BOEM's consumer surplus estimates include "benefits afforded consumers in the form of reduced oil and gas prices generated by the incremental oil and gas supplied from the program."[76] Considering the benefits of final consumption without considering costs introduces a clear bias in favor of the proposed Program and distorts the benefit-cost balance reported in the NPB analysis. This is especially true for costs related to consumption that are as large as these.

In Appendix 1, we estimate the magnitude of carbon emissions damage BOEM would likely find from both OCS leasing activities and final consumption using standard greenhouse gas (GHG) accounting protocols and the federal government's own social cost of carbon (SCC) methodology. Using a present value SCC of $21.40 per metric ton of carbon dioxide, we find that annual costs would be $259 to $635 million for the low and high production estimates. This represents a present value of $6.35 to $15.57 billion for this externalized cost over a 45-year production period. Thus, if factored into the NPB analysis, the social costs of carbon could have a significant bearing on Program economics.

[73] Batker et al. (2010), note 38, Table 6 at 43.
[74] In defending its decision not to assign a monetary value to carbon emissions, BOEM maintains that carbon emissions damage "cannot be quantified to a comparable degree with the other external costs" (BOEM 2011c at 9). This finding is peculiar given that the DOI is part of a team of federal agencies that has developed methods to do so.
[75] DPEIS at 1-18.
[76] BOEM (2011c), note 4 at 7.

4. The NPB analysis is not incorporated into the DPEIS as required by NEPA procedures.

To the extent that federal decisions significantly affecting the quality of the human environment are informed by BCA, NEPA procedures specify how to incorporate BCA into environmental impact statements and foster balanced consideration of the BCA's findings in relation to other values that may be more difficult to quantify. Unfortunately, BOEM has not followed NEPA procedures and, as a result, any decision to approve the Program now would rest on a biased analysis in favor of the proposed action.

a. The NPB analysis is not incorporated or discussed in relation to any of the factors specified by CEQ regulations implementing NEPA.

As previously noted, CEQ regulations implementing NEPA contain explicit guidance related to BCA in the NEPA process.[77] To paraphrase its key requirements: (1) when a BCA relevant to choice of alternatives is prepared, it must be incorporated by reference or appended to the EIS; (2) the EIS must discuss the relationship between the BCA and any unquantified environmental impacts, values, and amenities, and (3) the EIS should also indicate those considerations, including factors not related to environmental quality, which are likely to be relevant and important to a decision.

Clearly, the NPB (synonymous with BCA) analysis prepared by BOEM is relevant to the choice of alternatives. For example, in selecting options for the size, timing, and location of areas proposed for leasing, BOEM relied on several guiding principles, including: "[f]or areas with known estimated hydrocarbon resources, consider leasing if, from a national and regional perspective, anticipated benefits from development substantially outweigh estimated environmental risks."[78] As such, benefit-cost (or benefit-risk) criteria are a key decision factor.

As another indication, and as discussed above, the DPEIS presents strong opposition to the no action alternative based on the increased quantity of oil imports predicted by the MarketSim module of the NPB analysis: "[t]o ensure that demands for oil and gas are met, MarketSim projects a sharp increase in oil and gas imports under the No Action Alternative, via both tanker and pipeline."[79] Spills associated with these imports are the basis for the majority of environmental and social costs modeled in the NPB anlaysis. Finally, it should be noted that the proposed Program has the highest net economic value among all the alternatives considered.[80]

Despite the important role the NPB has played in development of the proposed Program and analysis of alternatives in the DPEIS, BOEM did not append the NPB analysis to the DPEIS or incorporate it by reference. Thus, its findings, assumptions, methods, and data

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[77] 40 CFR § 1502.23.
[78] Program at 17.
[79] DPEIS at 4-496.
[80] Program at Table 16, page 108.

sources are not disclosed or subject to public comment. Nor does the required discussion of the relationship between the NPB analysis and important unquantified impacts, values, and amenities appear in the DPEIS. As discussed above, these impacts, values, and amenities include ecosystem services, option and bequest values, passive use values, externalities such as carbon emissions damages and public subsidies.

b. Failure to do so biases decision making in favor of the proposed action.

In preceding sections, we identified a number of ways the NPB analysis is skewed in favor of the proposed action. Failure to put the NPB analysis in a proper context established by NEPA regulations extends this bias to the decision making process itself. Court decisions have recognized that, where economic analysis forms the basis of choosing among alternatives, NEPA requires that the analysis not be misleading, biased, or incomplete.[81] Inaccurate economic information may defeat both purposes of an EIS by "impairing the agency's consideration of the adverse environmental effects of a proposed project" and "skewing the public's evaluation of a project."[82]

Where the proposed action is based, at least in part, on economic benefits, the agency is required to balance those benefits "against the potential adverse environmental consequences."[83]

"The use of inflated economic benefits in this balancing process may result in approval of a project [or plan] that otherwise would not have been approved because of its adverse environmental effects."[84]

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[81] See Seattle Audubon Soc'y v. Lyons, 871 F. Supp. 1291, 1324 (W.D. Wash. 1994) ("NEPA requires, where economic analysis forms the basis of choosing among alternatives, that the analysis not be misleading, biased, or incomplete.").

[82] Hughes River Watershed Conservancy v. Glickman, 81 F.3d 437, 446 (4th Cir. 1996); see also Nat'l Wildlife Fed'n v. Nat'l Marine Fisheries Serv., 235 F. Supp. 2d 1143, 1157 (W.D. Wash. 2002) ("An EIS that relies upon misleading economic information may violate NEPA if the errors subvert NEPA's purpose of providing decisionmakers and the public an accurate assessment upon which to evaluate the proposed project.").

[83] California v. Block, 690 F.2d 753, 764 (9th Cir. 1982); see also Hughes River, 81 F.3d at 446 ("NEPA requires agencies to balance a project's economic benefits against its adverse environmental effects."); Sierra Club v. Sigler, 695 F.2d 957, 978 (5th Cir. 1983).

[84] Hughes River, 81 F.3d at 446; see also Laub v. United States Dep't of the Interior, 342 F.3d 1080, 1087 (9th Cir. 2003) (finding that a "decision to convert agricultural land and water to other uses could be influenced by an environmental analysis that properly considered [economic] effects."); MooreFORCE, Inc. v. United States Dep't of Transp., 243 F. Supp. 2d 425, 437-39 (M.D. N.C. 2003) (evaluating significance of potentially misleading traffic and economic information in the FEIS); Sigler, 695 F.2d at 978 (5th Cir. 1983) ("In order for an agency to carry out this broad systematic cost-benefit analysis, it is vitally important that the FEIS relied on by the agency fully and accurately disclose the environmental, economic, and technical costs associated with the project."); South Louisiana Environmental Council, Inc. v. Sand, 629 F.2d 1005, 1011 (5th Cir. 1980) ("In order for a reviewing court to determine whether an agency has complied with NEPA by giving a 'hard look' at the environmental considerations, the court must also consider whether the economic considerations, against which the environmental considerations are weighed, were so distorted as to impair fair consideration of those environmental consequences."); Chelsea Neighborhood Ass'n v. United States Postal Serv., 516 F.2d 378, 387-88 (2d Cir. 1975) (finding inadequate an EIS that used the benefits of a housing project but failed to disclose many of the costs).

5. The NPB analysis fails to adequately address uncertainty by ignoring a wide range of policy interventions likely to impact Program economics over the next four decades.

The NPB analysis was apparently completed in a policy vacuum. Energy policy interventions at federal, state, and local levels have a profound influence on demand, supply, and price in both primary oil and gas markets considered in BOEM's MarketSim model and secondary markets for substitutes to OCS production. A rigorous NPB analysis would address the impacts of likely and significant interventions.

The range of policy interventions affecting Program economics can be broken down into two major categories: (1) policies affecting supply of one source relative to another, and (2) policies affecting displacement in consumption of one source over another. A partial listing is included in Appendix 4. An example of the former is the proliferating number of federal and state initiatives supporting renewable energy. An example of the latter is EPA's recent decision to allow roughly 60 percent of the current vehicle fleet to be eligible to use E15 ethanol blends. While modeling the effects of such policies over the 40 – 50 year analysis period can be a daunting task, clearly, they must be considered at least in a simplified manner through sensitivity analysis, whereby key assumptions (i.e., the price and supply of substitutes) are altered to account for uncertainty.

6. Conclusions

As the foregoing analysis suggests, the net public benefits analysis BOEM prepared to justify the 2012 – 2017 Outer Continental Shelf Oil and Gas Leasing Program has some serious deficiencies and ought to be substantially reworked before used as a basis for decision making. The benefits of no action – an alternative required by NEPA and professional standards of NPB analysis – have been entirely overlooked. While the costs of no action are addressed at length, benefits are not acknowledged, even in a cursory manner. Such benefits arise from the flow of valuable ecosystem services provided by intact marine and terrestrial ecosystems affected by the Program in their natural state. These benefits also include the option value of waiting to extract OCS oil and gas resources when it is optimal to do so from an intergenerational equity perspective. Both the NPB and DPEIS should be revised to identify and monetize the benefits of no action so this alternative can be compared in a balanced manner with the proposed action.

The NPB analysis also significantly overstates Program benefits by exaggerating the Program's ability to affect prices of final petroleum products consumed by the American public. Recent experience casts serious doubt on whether or not the relatively tiny share of oil OCS production introduces into global markets can affect price at all, let alone significantly. BOEM's benefit estimates are also confounded by two apparent errors in scope. First, private profits to oil and gas companies are included as a public benefit. This is inconsistent with both professional and legal standards for net public benefits analysis. Second, the NPB includes profits (even if they could be properly included) earned by foreign firms as well as consumer surplus enjoyed by foreign consumers of final petroleum products refined from OCS oil and then exported overseas. This violates BOEM's stated intent to limit the scope of analysis to effects on the American public.

The NPB analysis is also flawed in its failure to consider three major categories of costs. The first is the substantial costs borne by public agencies at the federal, state, and local level who subsidize the exploration for, development, production and consumption of fossil fuels. The second is the damages to intact marine and terrestrial ecosystems caused by OCS operations and infrastructure. While some environmental externalities are commendably included in BOEM's analysis, there are also big omissions such as the costs of lost wetlands or loss of passive use values for marine mammals harmed by Program operations. The third cost category is one that must be considered by BOEM and all other federal agencies if the nation is to deal with climate change in a serious manner – the costs of carbon emissions. There are standardized tools developed by the federal government for estimating the carbon emissions damage associated with OCS leasing activities. These should be applied in the final NPB analysis.

Another apparent omission from the NPB analysis is consideration of the wide range of federal, state, and local policy initiatives that will affect Program economics over the next 40 – 50 years. Such policy interventions can affect price, supply, and demand in both the primary and secondary markets considered in BOEM's analysis and should, at minimum, be factored into the analysis of uncertainty.

What are the implications of these deficiencies? The table below provides an indication of what BOEM may find if its NPB analysis is revised to address at least some of these concerns. Beginning with BOEM's initial net benefits calculations for the proposed action we make a series of adjustments to eliminate private profits and consumer surplus generated abroad and include costs of public subsidies and carbon emissions damage.

The magnitude of the adjustments is based on the preliminary figures reported above, and should not be considered final by any means. Rather, they are meant to illustrate the potential magnitude of what BOEM may find. By just making these four adjustments, Program economics change drastically. Net public benefits would likely fall to just 6-15% of those reported by BOEM in its current economic analysis. The economics would only worsen by adequately addressing the other deficiencies noted above.

Finally, and on a more procedural note, BOEM has entirely failed to incorporate the NPB analysis into the DPEIS as required by NEPA procedures. This is not a superfluous exercise. By incorporating the NPB analysis, decision makers and the general public will benefit from viewing the NPB analysis in proper context in relation to unquantified environmental impacts, values, and amenities – a major goal of the NEPA process, and one that fosters improved decision making.

Potential Effect of Four Key Adjustments on Program Economics

Net Public Benefits (NPB) Scenario	NPB ($ billions) High prices	NPB ($ billions) Medium prices	NPB ($ billions) Low prices
Program as is	$271.44	$139.95	$49.62
Program less private profits	$58.01	$43.24	$26.19
Program less private profits and foreign consumer surplus[85]	$44.78	$32.78	$18.88
Program less private profits and foreign consumer surplus and subsidies[86]	$31.52	$23.47	$13.77
Program less private profits, foreign consumer surplus, subsidies and GHG emissions damage[87]	$15.95	(n/a)	$7.42

[85] As discussed in Section 2(c), it is likely that more than 50% of final petroleum products refined from OCS oil will be exported. To be conservative, we use this 50% figure. To make the adjustment, we multiplied the net consumer surplus estimated for each planning region by the oil share of total production in each region and then multiplied this figure by 50%, the presumed final petroleum product export share.

[86] In Section 3(a) and Appendix 2 we develop a subsidy estimate of $2.64 per barrel, which is applied here to OCS oil production estimates for each price scenario.

[87] Methodology discussed in Section 3(c) and Appendix 1.

Appendix 1:
Potential Carbon Emissions Damage Associated with the Proposed OCS 2012 – 2017 Oil and Gas Leasing Program

As with other major fossil fuel development projects, BOEM's proposed OCS Oil and Gas Leasing Program will be a significant source of greenhouse gas emissions and thus play a role in exacerbating global climate change. The federal government and the scientific community have developed tools and methods to quantify such emissions and estimate their social costs. Center for Sustainable Economy has applied these tools and methods to the production estimates for the Program in order to get a sense of the magnitude of external costs associated with greenhouse gas (GHG) emissions and the impacts of incorporating these costs into BOEM's draft net public benefits analysis.

We begin with GHG emissions figures reported in the DPEIS for certain exploration, development, production, and transportation activities associated with Alternative 1—the Proposed Action. We build upon those estimates by including GHG emissions from consumption of products from the oil produced as a result of leasing that takes place under the Program. We then assign a monetary value using the federal government's social cost of carbon (SCC) methodology.

GHG emissions included in the DPEIS

The DPEIS includes emission estimates for three GHGs for activities associated with proposed lease sales in the Central, Eastern, and Western Gulf of Mexico (GOM) and Cook Inlet, Beufort Sea, and Chuckhi Sea, Alaska Planning Areas.[88] GHG emissions are calculated by summing the estimated emissions of "platform" and "non-platform" equipment and operations as reported in USDOI's *Year 2008 Gulfwide Emission Inventory Study* (Annex 1).[89] That study reports GHG emissions from one year of operating equipment or conducting operations.

The DPEIS reports emissions for the entire Five-Year Leasing Program, but compares them to total 2009 U.S. emissions so the figures are likely annualized. All air emissions in the DPEIS, including GHG emission estimates, are reported as a range based on the low and high ends of exploration and development scenarios in Alternative 1—the Proposed Action (Table A1-1).

[88] The draft PEIS organizes the Planning Areas are organized into three categories, including the GOM, Alaska—Cook Inlet, and Alaska—Arctic.
[89] U.S. Department of the Interior (DOI1). Bureau of Ocean Energy Management, Regulation, and Enforcement. 2010. *Year 2008 Gulfwide Emission Inventory Study*.

Table A1-1:
GHG Emission Estimates Reported in the DPEIS[90]

Pollutant	2012-2017 program (Tg CO_2 equivalent)		
	GOM	Alaska—Cook Inlet	Alaska—Arctic
CO_2	3.75–7.65	0.1363–0.2100	0.80–2.07
CH_4	0.59–1.14	0.0028–0.0028	0.01–0.04
N_2O	0.03–0.06	0.0006–0.0010	0.006–0.019

<u>GHG emissions omitted from the DPEIS</u>

Notably, consumption-related GHG emissions are not reported in the DPEIS. However, both the DPEIS and the *Proposed Outer Continental Shelf Oil & Gas Leasing Program 2012-2017* program document contain production estimates for the Planning Areas.[91] Table A1-2 compares the reported production estimates.

Table A1-2:
Production Estimates Reported in the DPEIS and Program Document[92] [93] [94]

Resource	GOM		Alaska—Cook Inlet		Alaska—Arctic	
	DPEIS	Program document	DPEIS	Program document	DPEIS	Program document
Oil (billion barrels)	2.7-5.4	2.8-5.4	0.1-0.2	0.1-0.2	0.7-2.5	0.7-2.6
Natural gas (trillion cubic feet)	12.0-24.0	12.1-23.8	0.0-0.07	0.0-0.7	0.0-10.2	0.0-10.2

Rough GHG emission estimates can be derived from the production estimates. Since the reported production estimates are similar between the two documents, DPEIS figures are used to remain consistent with reported GHG emissions estimates for Alternative 1—the Proposed Action. We use the World Resources Institute's GHG Protocol to calculate emissions from combustion of multiple fuels and fuel types.[95] To use that protocol, a user must input assumptions regarding:

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[90] U.S. Department of the Interior (DOI2). Bureau of Ocean Energy Management. November 2011. *Proposed Outer Continental Shelf Oil & Gas Leasing Program 2012-2017*.
[91] The DPEIS includes oil and natural gas "production" estimates for Alaska—Cook Inlet and Alaska—Chukchi Sea. For the GOM, the DPEIS includes "potentially available" oil and natural gas estimates. It is not clear whether the potentially available estimates also are production estimates. This paper assumes that all potentially available oil and natural gas will be recovered.
[92] Estimates assume wells produce for 40-50 years.
[93] U.S. Department of the Interior. Bureau of Ocean Energy Management. November 2011. *Outer Continental Shelf Oil and Gas Leasing Program 2012-2017: Draft Programmatic Environmental Impact Statement*.
[94] DOI2, op. cit., p. 98.
[95] World Resources Institute. 2008. GHG Protocol Tool for Stationary Combustion. Version 4.0.

- Combustion type (e.g., mobile, stationary);
- Emissions factors;
- Fuel (e.g., natural gas liquids, bunker fuel);
- Fuel amount;
- Fuel type (e.g., liquid fossil, biomass);
- Global Warming Potential (GWP);
- Sector (e.g., manufacturing, construction); and
- Units.

If it were to estimate combustion-related GHG emissions from produced oil and natural gas, BOEM would need to assume values for each of the variables. A rough estimate of GHG emissions from oil assumes:

- Combustion type: Stationary
- Emissions factors: 2006 IPCC Guidelines for National Greenhouse Gas Inventories
- Fuel: Crude oil
- Fuel amount: DPEIS production estimates
- Fuel type: Liquid fossil
- GWP: 2007 IPCC Fourth Assessment Report
- Sector: Energy
- Units: Barrel (bbl)

Combustion of final petroleum products would produce emissions over the production life of wells in the Planning Area, which are estimated between 40 and 50 years in the DPEIS. Table A1-3 contains combustion-related GHG emissions from final petroleum products refined from OCS oil produced in the Planning Areas for each year of an assumed, average 45-year well production life. To simplify the analysis, we use oil combustion factors rather than those for final products. There are no significant differences in the results either way.

Table A1-3:
GHG Emissions Estimates from Oil Combustion
Using Production Estimates from the DPEIS

Pollutant	Annual emissions over 45-year well production period (Tg CO_2 equivalent)		
	GOM	**Alaska—Cook Inlet**	**Alaska—Arctic**
CO_2	23.66-47.32	0.8764-1.7528	6.13-21.91
CH_4	0.00-0.00	0.0000-0.0006	0.00-0.00
N_2O	0.00-0.00	0.0000-0.0000	0.000-0.000

For natural gas, a rough estimate of GHG emissions assumes

- Combustion type: Stationary
- Emissions factors: 2006 IPCC Guidelines for National Greenhouse Gas Inventories
- Fuel: Natural gas
- Fuel amount: DPEIS production estimates

- Fuel type: Gaseous fossil
- GWP: 2007 IPCC Fourth Assessment Report
- Sector: Energy
- Units: Foot[3]

Table A1-4 contains annualized, combustion-related GHG emissions for the 45-year well production life.

Table A1-4:
GHG Emissions Estimates from Natural Gas Combustion Using Production Estimates from the DPEIS

Pollutant	Annual emissions over 45-year well production period (Tg CO_2 equivalent)		
	GOM	Alaska—Cook Inlet	Alaska—Arctic
CO_2	14.24-28.47	0.0000-0.0830	0.00-12.10
CH_4	0.00-0.00	0.0000-0.0000	0.00-0.00
N_2O	0.00-0.00	0.0000-0.0000	0.000-0.000

<u>Social cost of combined GHG emissions</u>

GHG emissions from the Five-Year Program and oil and natural gas consumption cause climate change that affects U.S. citizens' quality of life. Researchers, including the U.S. government, assess the cost to society for each unit of emitted GHG through the social cost of carbon (SCC).

The U.S. government has a methodology for calculating SCC and uses it in cost-benefit analyses for proposed regulations. Executive Order 12866 requires agencies "to assess both the costs and the benefits of the intended regulation and, recognizing that some costs and benefits are difficult to quantify, propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify its costs."[96] In February 2010, an Interagency Working Group (IWG) developed a methodology and calculated a range of SCC values for use in cost-benefit analyses. Using this methodology, emissions associated with exploration, production, consumption can be quantified.

The IWG values are $4.70, $21.40, $35.10, and $64.90 per tonne of CO_2 emissions in 2010 using 2007 dollars.[97] Values vary because of their discount rate, or the amount the current generation imposes on itself to benefit future generations.[98] IWG's $4.70, $21.40, and $35.10 values have 5, 3, and 2.5 percent discount rates, respectively. The fourth value,

[96] 58 Federal Register 190 (October 4, 1993), pp 51735-51744. "Executive Order 12866— Regulatory Planning and Review."
[97] Interagency Working Group on Social Cost of Carbon, United States Government (IWG). February 2010. *Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866*.
[98] Greenspan Bell, Ruth and Dianne Callan. 2011. "More than Meets the Eye: The Social Cost of Carbon in U.S. Climate Policy, in Plain English." Washington, D.C.: World Resources Institute.

$64.90, represents higher-than-expected impacts from temperature change so uses a higher base value but discounts it at 3 percent.

IWG calculates global SCC values that account for the significant variability in dealing with climate change impacts in countries throughout the world. For example, some countries are better positioned than other countries to cope with floods caused by climate change. For isolating just the SCC for U.S. citizens, IWG recommends using a percent of the global SCC. The recommended low estimate is 7 percent based on assumptions in a model used by IWG and the high estimate is 23 percent based on the U.S. share of global GDP in 2008. IWG also recommends using just CO_2 and not CH_4 or N_2O even after those values are converted to CO_2 equivalent.

The $21.40 per ton value for 2010 in 2007 dollars, using a 3 percent discount rate, is used in U.S. government cost-benefit analysis.[99] For 2012, the first year of the 5-Year Program, the value would rise to $22.70 due to inflation. The domestic value would then be $5.22. Table A1-5 contains SCC values for the combined CO_2 emissions reported in the DPEIS and emitted during consumption (i.e., CO_2 from Tables A1-1, 3, and 4).

Table A1-5:
SCC Values for GHG Emissions Reported in the DPEIS and Emitted During Consumption of Produced Oil and Natural Gas[100]

Pollutant	Annual emissions over 45-year well production period (Tg CO_2 equivalent)		
	GOM	Alaska—Cook Inlet	Alaska—Arctic
CO_2	$217,413,000-$435,556,800	$5,286,294-$10,679,076	$36,174,600-$188,337,600

The SCC of the Five-Year program, using the assumptions included in this section, range from $258,873,894 for combined low production estimates to $634,573,476 for combined high estimates. By including SCC for some Planning Areas and excluding others, values for other Alternative exploration and production scenarios in the DPEIS can be estimated. The calculations in this section are not detailed, and BOEM will need to make other assumptions if it is to calculate SCC from Five-Year Program activities and fuel consumption more accurately.

[99] Greenspan Bell, op. cit., p. 3.
[100] To calculate the SCC, CO2 emissions were converted from Tg to tonnes.

Annex 1: Platform and Non-platform Equipment Assigned Emissions Estimates in the USDOI Studies[101]

Platform	Non-platform oil/gas production sources	Non-platform non-oil/gas production sources
Amine units	Drilling rigs	Biogenic and geogenic sources
Boilers/heaters/burners	Pipelaying operations	Commercial fishing vessels
Diesel engines	Support helicopters	Louisiana Offshore Oil Platform
Drilling equipment	Support vessels	Military vessels (Coast Guard/Navy)
Combustion flares	Survey vessels	Vessel lightering
Fugitive sources		
Glycol dehydrators		
Losses from flashing		
Minor sources		
Mud degassing		
Natural gas engines		
Natural gas turbines		
Pneumatic pumps		
Pressure/level controllers		
Storage tanks		
Cold vents		

[101] DOI1, op. cit., p. 6.

Appendix 2:
Public Financial Costs Associated with the
Proposed OCS 2012 – 2017 Oil and Gas Leasing Program

The Obama Administration has supported reducing or eliminating U.S. public financial assistance to fossil fuel companies. In 2009, the Administration's proposed budget would have eliminated tax preferences for the industry totaling in excess of $30 billion between 2010 and 2019.[102] Also in 2009, the Administration proposed that G20 countries eliminate non-needs-based fossil fuel and electricity subsidies.[103] Finally, the President submitted a deficit plan in October 2011 to the Joint Select Committee on Deficit Reduction recommending repealing the "last-in, first-out" accounting method for valuing inventory that assumes sold inventory items are equal in cost to inventory items most recently acquired. Since inventory costs rise over time, the accounting method reduces taxable income through artificially high deductions for goods sold from older inventory with a lower purchase price. Repeal would have saved $52 billion between 2011 and 2021.[104] The deficit plan would also have eliminated tax credits and reductions totaling $41 billion over the same time period.[105]

Such financial assistance reduces the private cost for exploration and development of OCS oil and natural and gas. Additional financial support from U.S. and state governments reduces fuel costs for oil and natural gas consumers. Presumably, the combined financial assistance is reflected implicitly in the 5-Year Program's Economic Analysis Methodology, which sets price level assumptions at $60, $110, and $160 per bbl oil and $4.27, $7.83, and $11.39 per mcf natural gas. In turn, those price level assumptions affect forecasted production costs because the economic methodology bases cost estimates on price projections (i.e., the analysis calculates cost using a price elasticity factor). Both price and cost ultimately affect consumer and producer surplus, which are two main values in determining whether the 5-Year Program generates net benefits. For oil, financial assistance likely has a minimal impact on price because prices result from global supply and demand, and U.S. proved crude oil reserves represent less than two percent of the world total.[106] However, alternative uses of that financial assistance, such as investment in domestic renewable energy, could notably affect consumer oil demand. For natural gas, financial assistance has a larger price impact than it does on oil because most natural gas consumed in the United States is produced domestically. In 2009, the Office of Economic Policy at the Department of Treasury estimated that natural gas subsidies equaled about

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[102] Krueger, Alan. 2009. "Statement of Alan B. Krueger Assistant Secretary for Economic Policy and Chief Economist, US Department of Treasury Subcommittee on Energy, Natural Resources, and Infrastructure." Available at http://www.treasury.gov/press-center/press-releases/Pages/tg284.aspx.
[103] Froman, Michael. 2009. White House Letter to G20 on Pittsburgh Summit Agenda. Available at http://priceofoil.org/wp-content/uploads/2009/09/froman-letter-on-pittsburgh-summit-agenda.pdf
[104] Sands, Derek. September 19, 2011. "Obama deficit plan includes repeal of US oil and gas tax breaks." Platts News Service. Available at http://www.platts.com/RSSFeedDetailedNews/RSSFeed/Oil/6490324.
[105] Ibid.
[106] Krueger, op. cit.

one percent of natural gas revenues between 2007 and 2009, so removing subsidies could increase natural gas prices by about one percent.[107]

This section roughly estimates the cost to the U.S. public for exploration, development, and consumption of oil and natural gas produced in the OCS Planning Areas. BOEM could consider forecasting the effect on consumer and producer surplus from removing financial assistance.

<u>Financial assistance programs affecting OCS exploration and development and produced oil and natural gas consumption</u>

Financial assistance means different things to different people. In 2009, the Environmental Law Institute (ELI) published *Estimating U.S. Government Subsidies to Energy Sources: 2002-2008*.[108] In its inventory of federal fossil fuel subsidies, ELI includes tax expenditures, foregone revenues (i.e., tax breaks), grants, and direct payments. Conversely, the American Petroleum Institute notes, "[t]he oil and natural gas industry doesn't get taxpayer subsidies or credits. It gets business tax deductions that most other industries receive."[109] API also defines "subsidies" as "direct government spending" In a 1998 report for Greenpeace, *Fueling Global Warming: Federal Subsidies to Oil in the United States*, authors Douglas Koplow and Aaron Martin analyzed financial benefits to the oil industry from 13 "intervention types".[110] [111] The different understanding of financial assistance is a major reason for the variability in studies attempting to inventory government programs that intervene in oil and natural gas markets. Four high-profile studies of federal oil and gas financial assistance programs prepared since 1998 contain 33, 14, 19, and 31 programs, respectively (Annex 1).

In addition to federal programs, state and local governments provide their own financial assistance. Of the four reports reviewed for this section, two include state and local financial assistance programs. Combs (2008) lists Texas programs including crude oil severance tax incentives, natural gas severance tax incentives, exemptions from the motor fuels tax, diesel fuel tax exemptions, franchise tax exemptions, and local property tax exemptions.[112] Neeley (2010) lists Alaska's cash refunds for oil company exploration and development and/or tax credits, California's direct oil subsidies and foregone royalties, and

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107 Ibid.

108 Adeyeye, Adenike, James Barrett, Jordan Diamond, Lisa Goldman, John Pendergrass, and Daniel Schramm. 2009. *Estimating U.S. Government Subsidies to Energy Sources: 2002-2008*. Washington, D.C.: Environmental Law Institute.

109 American Petroleum Institute (API). 2011. "Energy Answers: U.S. Oil and Natural Gas—More Energy, More Jobs, More Federal Revenue." Available at http://www.api.org/policy/tax/upload/2011SummerRecessToolkitBrochure.pdf.

110 The intervention types include access, cross-subsidies, direct spending, government ownership, import/export restrictions, information, lending, price controls, purchase requirements, research and development, regulations, risk insurance and/or indemnification, and tax levies and exemptions.

111 Koplow, Douglas and Aaron Martin. 1998. *Fueling Global Warming: Federal Subsidies to Oil in the United States*. Washington, D.C.: Greenpeace.

112 Combs, Susan. 2008. *The Energy Report 2008*. Austin, TX: The Texas Comptroller of Public Accounts. Available at http://www.window.state.tx.us/specialrpt/energy/.

Texas's oil severance tax incentives, gasoline tax incentives, and state and local subsidies for oil and gas.[113]

<u>Financial assistance as a share of produced oil and natural gas price and cost</u>

Clearly, financial assistance programs affect prices of oil and natural gas and the costs of producing them. Any estimate of the monetary value of subsidies as a share of OCS prices and costs will need to assume many variables, including production estimates in the Planning Areas, end-use and end-use location for produced oil and natural gas, and financial assistance available for the 40 to 50 year production period for each OCS well. Such an estimate requires a rigorous methodology and modeling. However, a high-level estimate could rely on published public support estimates from a variety of sources, translate those into support per unit of production, and apply these to the Program production estimates to get at least a ballpark figure.

To accomplish this, we begin with OECD's most recent estimate of budgetary support and tax expenditures for fossil fuels.[114] OECD developed estimates for each OECD country, including the U.S. For the U.S., the report quantifies average annual expenditures for 25 separate production and consumption subsidies for oil and 18 for natural gas over the 2008 – 2010 period. For petroleum products, the estimate is $4.57 billion, $5.38 for natural gas.

Annual U.S. crude oil production for the five-year period between 2006 and 2010 was roughly 1.90 billion bbl. Annual gross natural gas withdrawals were 25,345,635,400,000 $foot^3$ over the same period, or 4.62 billion barrels in oil equivalent units (bbl-e). Dividing the public support estimates by these amounts suggests an average subsidy of $1.16 per bbl-e for natural gas, $2.41 per bbl for oil. If we apply these estimates to the Program projections, we arrive at an annual level of public support associated with OCS production and consumption that ranges from $5.10 to $13.26 billion in present value terms over a 45-year period. This, of course, is just a crude estimate that does not differentiate between imports or exports, production or consumption, or hone in on exactly what public support programs may or may not apply but instead represents a lump sum aggregate. Nonetheless, it is indicative of the level of public burden associated with bringing OCS oil and gas to market.

[113] Neeley, Todd. October 20, 2010. "How Taxpayers Subsidize Oil, Ethanol Industries." DTN/The Progressive Farmer. Available at http://www.dtnprogressivefarmer.com/dtnag/view/blog/getBlog.do?blogHandle=ethanol&blogEntryId=8a82c0bc2a8c8730012bd556bf450fce.
[114] Sauvage, Jehan. 2011. United States: Inventory of Estimated Budgetary Support and Tax Expenditures for Fossil Fuels. Paris: Organization for Economic Cooperation and Development.

Annex 1: Studies Vary in Their Inventory of U.S. Government Financial Assistance Programs for the Oil and Gas Industry

Financial assistance program	Koplow et al., 1998*	Combs, 2008	Adeyeye, 2009	Neeley, 2010*
Accelerated depreciation allowance	✓	✓		✓
Alaska Native Claims Settlement Act property rights clause	✓			
Alternative (non-conventional) fuel production credit	✓	✓	✓	✓
Annualized losses due to artificially low posted prices[α]	✓	✓	✓	✓
Bonding shortfalls for existing wells	✓			
Deferral of income from controlled foreign corporations	✓			✓
Deferral of tax on shipping companies	✓			
Enhanced oil recovery credit	✓		✓	✓
Exception from passive loss limitation for working interests in oil and gas properties	✓	✓		✓
Exclusion of interest on IDBs for seaports and marine terminals	✓			
Exemptions from net operating loss restrictions for Alaska Native Corporations	✓			
Expensing of exploration and development costs credit	✓	✓	✓	✓
Expensing of tertiary injectants	✓			✓
Federal subsidy offsets from special taxes on oil	✓			
Foreign Tax Credit	✓	✓	✓	✓
Fossil energy R&D at USDOE	✓	✓		✓
Incremental reduction in state taxes due to Federal tax breaks benefitting oil	✓			✓
Lapses in BLM royalty auditing	✓			
Percentage depletion allowance	✓	✓	✓	✓
Tax credit for expensing of research and experimentation expenditures	✓			
Low Income Home Energy Assistance Program	✓		✓	✓
US Export-Import Bank and US Overseas Private Investment Corporation lending program	✓			✓
US government land lease management	✓			
US government oil spill response	✓		✓	✓
US Maritime Administration (financial support for US flag ship operators)	✓			
US Research and Special Programs Administration Office of Pipeline Safety	✓			
USACE, US Coast Guard, and USNOAA provision and maintenance of transportation infrastructure and services	✓			✓
USDOD domestic and foreign supplies	✓			
USDOE Strategic Petroleum Reserve	✓	✓	✓	✓
USEIA research on oil production and markets	✓			✓
USEPA and US Coast Guard industry regulation	✓			✓
USFERC market regulation	✓			
USGS and USMMS research on oil contamination	✓	✓		
Highway Trust Fund			✓	✓
Natural Gas Arbitrage Exemption			✓	

Natural Gas gathering lines treated as 7-year property in AMT			✓	
Health, environmental effects of leaking motor vehicle storage tanks				✓
Commuter benefits exclusion from income				✓
Northeast Home Heating Oil Reserve			✓	✓
Sulfur regulatory compliance incentives for small diesel refiners			✓	✓
Expensing liquid fuel refineries			✓	✓
Exclusion of alternative fuels from fuel excise tax			✓	✓
Federal stimulus funds				✓
Domestic manufacturing tax deduction				✓
USDOE Naval Petroleum and Oil Shale Reserves		✓	✓	✓
Natural gas distribution pipelines treated as 15-year property		✓	✓	
Amortize all geological and geophysical expenditures over two years		✓	✓	✓
Temporary 50% expensing for equipment used in the refining of liquid fuels		✓		✓

* Study includes only financial assistance programs for oil.
[α] Includes USDOI royalty losses on 1998 and 1999 Gulf oil and gas leases.

Appendix 3:
Share of Outer Continental Shelf
Oil and Gas Leases Owned by Foreign Companies

Some stakeholders espouse the national security benefits of the Outer Continental Shelf (OCS) leasing programs. For example, Secretary Salazar's statement on the 2007-2012 program notes "… the crucial role that OCS oil and gas production plays in helping to reduce the Nation's dependence on foreign energy sources".[115] Laborers' International Union of North America Local 341 notes in comments on the proposed 2007-12 program that "MMS [Minerals Management Service] [should] allow for more acreage to allow for work opportunities and to alleviate a dependence on foreign oil".[116] Senator Voinovich of Ohio expressed concern about "whether the Department is moving adequately to promote domestic production, both onshore and offshore, to reduce reliance on foreign energy sources" noting "he is encouraged with the President's consideration of expanding OCS production, but there are still large areas in the Pacific, Atlantic, and Eastern Gulf of Mexico that remain off-limits".[117] Finally, Washington Policy Partners, LLC notes that access to increased lease acreage will "reduce dependence on foreign sources and generate jobs and revenues".[118]

Since the United States retains jurisdiction over OCS waters, opening areas to leasing sales does, technically, increase U.S. oil and gas resource potential. However, at least three factors affect the extent to which U.S. citizens and/or firms retain ownership over each link of the OCS oil and gas supply chain. First, and probably most important, foreign firms may bid, win, and develop OCS leases. Second, mobile offshore drilling units operating in U.S. waters may register under other countries' flags. The *Deepwater Horizon*, for example, was registered in the Marshall Islands.[119] Finally, foreign trusts can support site reclamation efforts for catastrophic events. In such cases, trustees would 1) return injured natural resources to their baseline condition (the condition that existed prior to the spill) and 2) recover compensation for interim losses.[120]

Foreign ownership of OCS leases has generated significant discussion in Congress recently. In November 2011, staff for Representative David Rivera (R-FL) asked the Department of the Interior for a list of foreign companies owning leases in the United States. At a hearing on November 16th, Rivera told Salazar "… they were surprised to learn that the government doesn't keep a database of what companies are foreign government-owned. The foreign government-owned companies are just mixed in with the regular privately owned

[115] U.S. Department of the Interior. Bureau of Ocean Energy Management, Regulation, and Enforcement. 2010. *Revised Program Outer Continental Shelf Oil and Gas Leasing Program 2007-2012*.
[116] Ibid.
[117] Ibid.
[118] Ibid.
[119] Haggerty, Curry and Jonathan Ramseur. 2010. "Deepwater horizon Oil Spill: Selected Issues for Congress." Congressional Research Service.
[120] Ibid.

companies".[121] Rivera also sponsored the Foreign Oil Spill Liability Act of 2011 that would end caps on the Oil Spill Liability Trust Fund and require foreign companies to pay the full cost of reclamation from catastrophic events.[122]

While the Department of the Interior does not have a database of foreign firms with OCS leases, some relevant information can be derived from OCS records. In the proposed 2012-2017 program, OCS waters in Alaska and the Gulf of Mexico are being considered for leasing. Table A3-1 uses public information from the Bureau of Ocean Energy Management to identify companies owning leases in Alaska OCS waters, number of leases owned by each company, and share of acreage for each company's combined leases.

Table A3-1:
Companies Owning Leases in Alaska OCS Waters and
Their Share of Available Acreage[123]

Company	Origin country of parent company	Number of leases	Share of acreage (percent)
Shell Gulf of Mexico Inc.	Netherlands	275	41.51
Repsol E&P USA Inc.	Spain	164	16.07
Shell Offshore Inc.	Netherlands	138	14.54
ConocoPhillips Company	United States	98	12.26
Eni Petroleum US LLC	Italy	89	5.77
Total E&P USA, Inc.	France	32	4.88
Statoil USA E&P Inc.	Norway	66	3.49
OOGC America, Inc.	United States	50	0.76
BP Exploration (Alaska) Inc.	United Kingdom	6	0.55
Iona Energy Company (US) Limited	Canada	1	0.15
Murphy Exploration (Alaska), Inc.	United States	1	0.01

Such information is not available for the Gulf of Mexico. Table A3-2 contains a partial list of foreign companies placing bids on Gulf of Mexico leases since 1996, the first year records are available.

[121] Starr, Penny. November 22, 2011. "No Answers from Interior Department on Number of Foreign Companies Drilling for Oil and Gas in U.S." Available at http://cnsnews.com/news/article/no-answers-interior-department-number-foreign-companies-drilling-oil-and-gas-us.
[122] Ibid.
[123] U.S. Department of the Interior (USDOI3). Minerals Management Service: Alaska OCS Region. 2011. Listing of Unit Areas by Owner. Available at http://www.boem.gov/uploadedFiles/BOEM/Oil_and_Gas_Energy_Program/Leasing/Regional_Leasing/Alaska_Region/Data/20110927%20Alaska%20Lessess%20by%20Acreage.pdf.

Table A3-2:
Partial List of Foreign Companies Placing Bids on Gulf of Mexico Leases[124]

Company	Origin Country
Alitheia Resources Inc.	France
BHP Billiton Petroleum (Deepwater) Inc.	Australia
Breton Energy, LLC	Australia
Byron Energy Inc.	Australia
Petrobras America Inc.	Brazil
Bayou Bend Offshore, Ltd.	Canada
EnCana Gulf of Mexico LLC	Canada
Nexen Petroleum Offshore U.S.A. Inc.	Canada
Ecopetrol America Inc.	Colombia
Maersk Oil Gulf of Mexico One LLC	Denmark
PetroVal, Inc.	France
TOTAL E&P USA, INC.	France
Eni Deepwater LLC	Italy
Eni Petroleum Exploration Co. Inc.	Italy
Eni Petroleum US LLC	Italy
Darcy Energy, LLC	Japan
Marubeni Oil & Gas (USA) Inc.	Japan
Nippon Oil Exploration U.S.A. Limited	Japan
Shell Gulf of Mexico Inc.	Netherlands
Shell Offshore Inc.	Netherlands
Statoil Gulf of Mexico LLC	Norway
Statoil Gulf Properties Inc.	Norway
StatoilHydro Gulf Properties Inc.	Norway
Repsol E&P USA Inc.	Spain
BP America Production Company	United Kingdom
BP Exploration & Production Inc.	United Kingdom
Cairn Energy USA, Inc.	United Kingdom

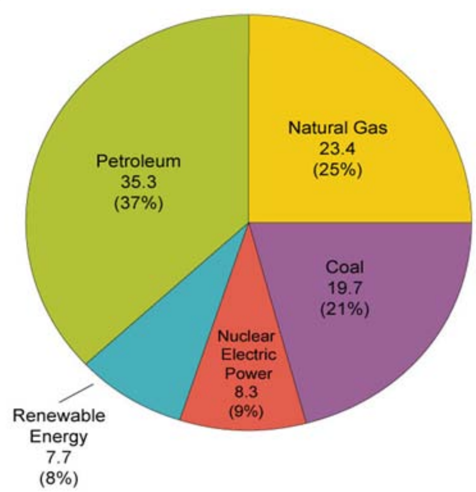
124 U.S. Department of the Interior (USDOI2). Final Bid Recaps for Gulf of Mexico sales 157 to 224.

Appendix 4:
Policy Factors Affecting Program Economics

Through OCSLA, the U.S. Department of the Interior (DOI) must consider "the economic, social, and environmental values of the renewable and nonrenewable resources" in a region considered for lease sales (43 U.S.C. § 1344(a)(1)). Within DOI, BOEM is tasked with managing development of the nation's resources in an environmentally and economically responsible way (76 FR 64432). To determine environmental and social costs, BOEM uses the *Offshore Environmental Cost Model* (OECM) and *Market Simulation Model* (MSM). OECM forecasts impacts on recreation, air quality, property values, subsistence harvests, fiscal impacts, commercial fishing, and ecology. MSM estimates substitution effects for offshore and natural gas development if one or more program areas are excluded from the 5-year leasing program.

Notably, neither OECM nor MSM consider mid- and long-term impacts on demand from government initiatives or other exogenous factors reducing domestic dependence on fossil fuels. In 2009, petroleum accounted for 37 percent of domestic energy consumption; natural gas, 25 percent; coal, 21 percent; nuclear electric power, 9 percent; and renewable energy, 8 percent (figure 1). Two conditions affect the extent to which U.S. energy consumers will use more of one energy source and less of another. First, supply of one source must increase relative to another. Second, the increased supply of one source must displace the consumption of another source. Both conditions are occurring in the United States in 2011 and should be considered by BOEM.

Figure 1: Government initiatives and other exogenous factors can displace sectors of the 2009 energy portfolio.
(Quadrillion BTU and percent)



Source: U.S. Energy Information Administration. Annual Energy Review 2009

Policies affecting supply of one source relative to another

<u>Liquid fuels taxes and tax credits</u>: Liquid fuels production (e.g., gasoline, diesel fuel, jet fuel, ethanol, biodiesel) fluctuates in part due to price incentives targeted toward consumers.

The Transportation Equity Act of 2005 taxes gasoline at 18.4 cents per gallon, diesel fuel at 24.4 cents per gallon, and jet fuel at 4.4 cents per gallon in nominal terms—that is, rates in 2005. Fuel taxes capitalize the Highway Trust Fund, which has seen decreased revenue in recent years due to improvements in vehicle efficiency and reduced demand. Federal or state taxes could increase in the long-term to finance road improvements, if the trend continues.

The fate of ethanol and biofuels incentives could affect production of those liquid fuels as well. The Food, Conservation, and Energy Act of 2008 provided a $0.45 per gallon Volumetric Ethanol Excise Tax Credit set to expire in 2010 and a $1.01 per gallon cellulosic biofuels production tax credit set to expire in 2013. The Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act of 2010 (TUJ) extended the Volumetric Ethanol Excise Tax Credit through 2011. TUJ also extended a $1.00 excise tax credit per gallon of biodiesel produced by converting vegetable oils or animal fats, and a $0.54 tariff on imported ethanol through 2011.

Renewable generation: Federal and state initiatives will increase renewable energy production. At the federal level, the American Recovery and Reinvestment Act of 2009 (ARRA) provided $23 billion in federal tax credits, new loan guarantees, and direct payments for renewable energy production such as wind turbines and solar panels.[125] Partly as a result, the U.S. Energy Information Administration (EIA) estimates the portion of electricity generated from renewable energy to grow from 3 percent in 2008 to 7 percent in 2012.[126]

Perhaps an even greater impact will come as a result of state laws requiring increases in renewable generation or capacity. As of 2010, 30 states and the District of Columbia had enforceable renewable portfolio standards (RPS) or similar laws. California has the largest RPS mandate, requiring 33 percent renewable generation by 2020.[127] New York has a 29 percent RPS requirement by 2015, New Jersey requires renewable energy to account for 22.5 percent of energy sales by 2021, and Pennsylvania has an 18 percent requirement by 2020.[128]

Shale gas development and permitting: Between December 2008 and December 2009, the EIA increased its estimate of domestic shale gas proved reserves[129] from 34.4 trillion cubic

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[125] U.S. Government Printing Office (USGPO1). 2011. *Economic Report of the President*. Available at http://www.gpoaccess.gov/eop/2011/pdf/ERP-2011.pdf (accessed December 10, 2011).
[126] U.S. Government Printing Office. 2009. *Economic Report of the President*, Chapter 9, Transforming the Energy Sector and Addressing Climate Change. Available at http://www.gpoaccess.gov/eop/2011/pdf/ERP-2011.pdf (accessed December 10, 2011).
[127] U.S. Energy Information Administration (USEIA). 2011. *Annual Energy Outlook 2011*. Available at http://www.eia.gov/forecasts/aeo/pdf/0383%282011%29.pdf (accessed December 10, 2011).
[128] Ibid.
[129] Proved reserves are the gas resources that could be recovered under current technological and economic conditions. Horizontal drilling and hydraulic fracturing are causing proved reserve estimates to increase rapidly.

feet (Tcf) to 60.6 Tcf [130] Now, the EIA estimate of 827 Tcf for shale gas and conventional unproved reserves[131] is equivalent to five years of global petroleum demand. Increased shale gas production, combined with low natural gas prices and incentives to retire and replace coal-fired power plants with natural gas plants, increases U.S. consumption at an annual rate of 0.6 percent between 2009 and 2035.[132] In the ranking of growth projections in U.S. energy consumption, shale gas places fourth behind renewable energy (3.6 percent), biomass (2.9 percent), and coal (0.8 percent).[133] Liquid fuels and other petroleum are estimated to grow annually at 0.5 percent.

State air emissions regulations: The Regional Greenhouse Gas Initiative (RGGI) and California Greenhouse Gas Reduction Program are two U.S. emissions trading programs for greenhouse gases. Through RGGI, 10 Northeast states will collectively reduce CO_2 emissions from the electric power sector by 10 percent by 2018. The cap consists of a history-based baseline and includes an allocation for growth. RGGI will likely need a more stringent cap if it is to reduce fossil fuel consumption; the existing cap is modest and at least one state, New Jersey, will withdraw from the program at the end of 2011 because auction prices are significantly lower than originally estimated.

The California Global Warming Solutions Act (Assembly Bill 32) includes a cap-and-trade program to help regulated utilities meet a goal of achieving 1990 emissions levels by 2020. The California Air Resources Board (CARB) unanimously approved program regulations in October 2011. Some details are still being developed, but the program will begin in 2013.

Policies affecting displacement in consumption of one source over another

California Low Carbon Fuel Standard: Fuel producers or importers selling transportation fuels in California must reduce the carbon intensity of motor gasoline or diesel fuel by 10 percent between 2012 and 2020.[134] The standard is likely to increase imports of renewable fuels in California in the mid-term. Notably, the standard cannot be met without gasoline blends exceeding E10, such as E85.[135]

Distributed generation/energy efficiency: Onsite generation improves energy efficiency compared to centralized generation. The generation model in industrialized economies that transports energy produced by coal, nuclear, natural gas, and hydropower to end-users over long distances results in significant energy waste. Nearly all states have some incentives supporting distributed generation, such as interconnection standards, standby rates, output-based emissions regulations, combined heat and power (CHP) incentives, and

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130 U.S. Energy Information Administration. 2011. "Shale Gas Proved Reserves and Production, 2007 – 2009". Available at http://www.eia.gov/pub/oil_gas/natural_gas/data_publications/crude_oil _natural_gas_reserves/current/pdf/table13.pdf (accessed March 1, 2011).
131 U.S. Energy Information Administration. 2011. *Annual Energy Outlook 2011 Early Release Overview*. Available at http://www.eia.gov/forecasts/aeo/pdf/0383er%282011%29.pdf (accessed February 13, 2011).
132 Ibid.
133 Ibid.
134 USEIA, op. cit.
135 Ibid.

net metering.[136] Notable initiatives include California's Self-Generation Incentive Program, which provides electric utility customers rebates for using clean distributed energy systems, and New York's uniform interconnection standards, which provide CHP systems with consistent procedures for purchasing backup power and selling generated electricity to the grid. Also, Pennsylvania utilities provide CHP users with favorable rates—instead of the utility maintaining capacity to meet peak demand for users in the event of a scheduled or emergency shut down of the CHP system, utilities negotiate contracts for a certain amount of demand capacity and charge for actual energy use. The approach makes CHP cost-competitive, or even cheaper, than energy from the grid.

Grid modernization: ARRA provided $10 billion for grid modernization to accommodate intermittent energy sources such as solar and wind.[137] Also, smart grid technology allows utility managers to release to the grid, and consumers to pay for and use, precise amounts of electricity as needed.[138]

Advanced vehicles and fuels technologies: ARRA provided $6 billion for domestic production of advanced batteries, vehicles, and fuels.[139] Potential technologies include batteries, advanced biofuels, plug-in hybrids, all electric vehicles, and support infrastructure.

Corporate Average Fuel Economy Standards: Regulations establishing a base rate of fuel consumption for vehicles were first passed by the U.S. Congress in 1975. In 2011, the equation for calculating corporate average fuel economy (CAFE) standards was changed to account for vehicle size, calculated as wheelbase multiplied by track width. As a proportion of size, a larger vehicle now faces a lower fuel economy standard than a smaller vehicle. In July 2011, President Obama and 13 automakers accounting for 90 percent of the domestic market agreed to increase CAFÉ standards annually to average 54.5 miles per gallon by 2025.[140]

EPA approval of E15 waiver: In January 2011, EPA provided a waiver allowing E15 ethanol blends in vehicles manufactured between 2001 and 2006. EPA's action extended a waiver from October 2010 applying to vehicles from manufacturing year 2007 and newer. Prior to the waiver, ethanol blends were set at 10 percent through a limit enacted in 1978. Approximately 60 percent of the current vehicle fleet are now eligible to use E15 ethanol blends, though infrastructure hurdles and consumer concerns over engine damage could delay deployment.

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136 American Council for an Energy Efficient Economy. 2011. "State Energy Efficiency Policy Database." Available at http://www.aceee.org/topics/standby-rates (accessed December 8, 2011).
137 USGPO1, op. cit.
138 York, Dan. 2009. "Smart Grid Policy Brief". American Council for an Energy Efficient Economy. Available at http://www.aceee.org/policy-brief/smart-grid (accessed December 8, 2011).
139 USGPO1, op. cit.
140 National Highway Traffic Safety Administration. 2011. "President Obama Announces Historic 54.5 mpg Fuel Efficiency Standard". Available at http://www.nhtsa.gov/About+NHTSA/Press+Releases/2011/President+Obama+Announces+Historic+54.5+mpg+Fuel+Efficiency+Standard.

APPENDIX C:

MAPS OF MARINE MAMMAL DISTRIBUTION IN THE BEAUFORT AND CHUKCHI SEAS

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Marine Mammal Concentration Areas of the US Arctic Waters North of 68° Latitude
DRAFT

This appendix contains a series of maps highlighting the seasonal concentration areas for marine mammal species in U.S. Arctic waters north of 68° latitude. Marine mammals are the most well-known and iconic species in the Arctic and are of vital importance to the communities and ecosystems of the region.

The abundance, seasonal concentrations and migratory patterns of whales, walruses, seals and other animals are connected to the rhythms of life in Arctic communities, and have been for generations. These species play an integral role in the cultures, personal health and economic well-being of thousands of Americans who live along Arctic shores. Those animals that migrate long distances to and from the Arctic, such as gray whales, also benefit communities throughout the U.S. west coast through tourism and as part of the overall quality of life for many coastal citizens.

As primary consumers at or near the top of the food chain, marine mammals also are critical in the structure and functioning of Arctic marine ecosystems. In most cases Arctic marine mammals are long-lived species with low reproduction rates, and many marine mammal species fill multiple roles within Arctic ecosystems. As a result, impacts to one species, or damage from an oil spill or other accident to a specific area where those species concentrate, are likely to have harmful effects not only to an individual species, but throughout the ecosystem.[1]

BOEM, therefore, must incorporate all available information, including the enclosed data on marine mammal use of specific areas at specific times, to avoid any potential impacts to these species and the areas most important to their long-term health and resilience. BOEM must also assess gaps in data or lack of information that create the potential for unexpected and undue harm to the health of the ecosystem and subsistence way of life that might have been more effectively prevented by better information.

To accomplish this goal, BOEM should use these maps and other data to help: 1) choose an alternative that ensures that actions resulting from the Proposed Program will not cause negative impacts to marine mammal concentration areas; 2) assess the potential impacts to these areas, and to marine mammals in general, for each alternative; and 3) begin the process to identify important areas requiring deferral and other protections.

The U.S. Geological Service Arctic science gap analysis recognized that synthesis information like this is important for guiding decisions to have less impact on the environment and the

[1] Bertness, M. D., S. D. Gaines, and M. Hay (Editors). 2001. Marine Community Ecology. 550 pages, Sinauer Associates, Sunderland, Massachusetts. *See generally*.

overall health of Arctic.[2] Until such information is gathered and additional science is completed, no new lease sales should be conducted in the U.S. Arctic.

Important Ecological Areas of the U.S. Arctic

The maps of marine mammal concentration areas included on subsequent pages are initial drafts developed by Oceana as part of a larger effort currently underway to identify Important Ecological Areas of the Arctic. Important Ecological Areas (IEAs) are geographically delineated areas which by themselves or in a network have distinguishing ecological characteristics, are important for maintaining habitat heterogeneity or the viability of a species, or contribute disproportionately to an ecosystem's health, including its productivity, biodiversity, function, structure, or resilience. IEAs include places like migration routes, subsistence areas, sensitive seafloor habitats, concentration areas, breeding and spawning spots, foraging areas, and places with high primary productivity.[3]

Looking at marine ecosystems through the lens of IEAs can help us better understand how to preserve the health, productivity, biodiversity and resilience of marine ecosystems while providing for ecologically sustainable fisheries and other economic endeavors, traditional subsistence uses, and viable marine-dependent communities.[4]

Even though it is in draft form, this information is critical to responsible management that will maintain the health of Arctic marine mammal populations and the ecosystem in general. The information builds on the recent Arctic Marine Synthesis prepared by Audubon Alaska in cooperation with Oceana, with updated information to incorporate much of the recent tagging work and additional suggestions from marine mammal experts.

While the maps are based primarily on “western” science, there is some data included from a handful of studies documenting the Local and Traditional Knowledge of Arctic peoples and communities. Oceana has been working with indigenous and community organizations to further document Local and Traditional Knowledge of marine mammals. Local and Traditional Knowledge is an equally valid source of information for understanding Arctic marine mammal abundance, distribution and life history, and is especially critical in the Arctic where there are so many gaps in western scientific information.[5]

It is also important to note that, while these maps represent our best understanding, there is relatively sparse information in many cases. For example, the summer distributions of bearded seals are based on only a few tagged animals. For most marine mammal species in the Arctic,

[2] Holland-Bartels, Leslie, and Pierce, Brenda, eds., 2011, An evaluation of the science needs to inform decisions on Outer Continental Shelf energy development in the Chukchi and Beaufort Seas, Alaska: U.S. Geological Survey Circular 1370, 278 p.
[3] Ayers et al., Important Ecological Areas in the Ocean: A Comprehensive Ecosystem Protection Approach to the Spatial Management of Marine Resources (Aug. 23, 2010), available at http://na.oceana.org/en/news-media/publications/reports/important-ecological-areas-in-the-ocean.
[4] *Id*.
[5] Huntington, H. P. 2000. Using traditional ecological knowledge in science: methods and applications. Ecological Applications 10:1270-1274.

there is not adequate information to even provide good estimates of population size. The USGS review discussed above should be a first step toward the completion of a more comprehensive gap analysis undertaken by an independent entity, such as the National Research Council, and the establishment of a comprehensive research program for the region.

These gaps in data and understanding only serve to reinforce the overall need for further scientific research and documentation of Local and Traditional Knowledge to more accurately delineate marine mammal concentration areas and identify Important Ecological Areas in the region.

Draft Maps of Seasonal Concentration Areas of Arctic Marine Mammals

The following pages contain distribution maps of marine mammal concentration areas for bearded seals, beluga whales, bowhead whales, gray whales, ribbon seals, ringed seals, spotted seals and Pacific walrus.

Concentration areas are defined as specific geographic regions where a species occurs consistently at higher densities than elsewhere within the study region or species range. As the use of the Arctic by marine mammals varies considerably throughout the year, we identified concentration areas for each season where there was sufficient data available. Concentration areas were identified directly from sources, digitized from existing studies, and/or hand drawn based on information in published studies or personal communications with experts.

The study region the maps cover is the U.S. Exclusive Economic Zone and coastal waters north of 68° latitude. This generally encompass the Arctic region under consideration for potential lease sales in the draft 2012-17 Five-Year Plan.

Draft Maps of Overlapping Concentration Areas for each Season

In addition to maps of concentration areas for each species, we have also included maps that show the overlap of all concentration areas of the eight species for each season. Overlapping concentration areas may indicate important areas for marine mammals generally due to location, physical characteristics, relationship to seasonal sea ice cover, or other factors. These overlapping areas warrant further consideration and stronger protective measures to ensure they are not affected by oil and gas activities or other industrial impacts.

BEARDED SEALS

Bearded seals are commonly found with drifting sea ice, usually in waters less than 650 ft (200 m) deep. They are solitary animals, and individual seals rest on single ice floes facing the water for an easy escape from predators. Their lifespan exceeds 25 years, with females giving birth to a single pup while hauled out on pack-ice usually between mid-March and May. Current abundance and population trends are unknown.

While bearded seals can be found in both the Beaufort and Chukchi seas year round, a large portion of the population overwinters in the Bering Sea. Bearded seals generally move north in late spring and summer as sea ice melts and retreats, and they then move south in the fall as sea ice forms.

In the Beaufort Sea, bearded seals are most numerous around the flaw zone between landfast and drifting pack ice and in the broken pack ice. They are not typically found on shore fast ice or the area covered by shore fast ice. Also, from recent—but very limited—tagging data it appears that during their northward migration these animals move from Kotzebue Sound up along the coast to feed within the coastal band of the Chukchi and Beaufort seas during the summer and fall. Aerial observations for marine mammals in the northern Chukchi Sea also indicate Bearded Seals are found in higher concentrations in the band of waters closer to shore (out to approximately 30-40 miles) than those waters farther offshore. Overall, the data to support the assertion of higher bearded seal densities in the coastal band versus farther offshore is limited.

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Arctic Alaska
Bearded Seal
25 0 25 50 75 100
miles
Study Area
Spring Concentration Area
Summer/Fall Concentration Area
165°W
160°W
155°W
150°W
145°W
73°N
72°N
71°N
70°N
69°N
68°N
67°N
ARCTIC OCEAN
Barrow
Wainwright
Atqasuk
Nuiqsut
Prudhoe Bay
Kaktovik
Beaufort Sea
Point Lay
Chukchi Sea
Point Hope
Kivalina
ALASKA
CANADA
UNITED STATES
OCEANA

BELUGA WHALES

Beluga whales are generally found in shallow coastal waters, but they have also been seen in deep waters. Belugas can be found swimming among icebergs and ice floes in the waters of the Arctic and subarctic, where water temperatures may be as low as 32° F (0° C). They are extremely social animals that typically migrate, hunt, and interact together in groups of ten to several hundred

Their lifespan is thought to be about 35-50 years. Beluga whales mate in the spring, usually in March or April, in small bays and estuaries. Females give birth to single calves (and on rare occasion twins) every two to three years on average, usually between March and September.

Five distinct populations of beluga whales occur in the United States, all in Alaska: Cook Inlet, Bristol Bay, Eastern Bering Sea, Eastern Chukchi Sea and Beaufort Sea. The study area is home to two of those five: the Eastern Chukchi Sea population and the Beaufort Sea population. Both are currently designated as healthy populations, with the latest estimates showing approximately 3,700 individuals in the Eastern Chukchi Sea population, and 40,000 individuals in the Beaufort Sea population.

The following map shows the spring, summer and fall concentration areas for the Eastern Chukchi and Beaufort populations. In the spring, the Beaufort population uses the Chukchi Sea ice lead system while migrating to the Mackenzie River delta region in Canada. In late June, the Eastern Chukchi population gathers outside of Omalik Lagoon south of Pt. Lay on the Chukchi Sea coast. They then migrate north along the coast, with concentration areas found along the coast, including in and around Barrow Canyon and near the shelf break off Point Barrow.

In addition, satellite tagging has shown that some beluga whales may travel north well offshore into the ice pack in very deep water during the summer, presumably to feed on Arctic cod. One whale was documented up to 80 degrees north in heavy ice. Other Eastern Chukchi individuals move out onto the Chukchi shelf break, as well as over into the eastern Beaufort Sea. A small portion of Beluga whales tagged in the Mackenzie River delta area (Beaufort population) have been shown to utilize areas along the Beaufort shelf break, including off the eastern portion of the Alaska coast, which has also been documented in summer aerial surveys for the region.

In early fall, satellite tagged whales from the Eastern Chukchi population clearly concentrate in Barrow Canyon as well as along the western Beaufort Sea shelf break. Satellite tagged belugas from the Beaufort Sea population indicate concentrations along the Beaufort Sea shelf break offshore during that same time as they migrate west and eventually across the Chukchi Sea. These concentration areas of belugas are also apparent in both the aerial surveys for whales in the Chukchi Offshore Monitoring in Drilling Area project and the Bowhead Whale Aerial Survey Project in the Beaufort Sea.

Belugas are an important subsistence species for the communities of Point Lay, Point Hope, Wainwright, and Barrow. In Point Lay, there is an annual organized community hunt that provides a very large portion by weight of the subsistence food for the community each year.

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Arctic Alaska
Beluga Whales
25 0 25 50 75 100
miles
Study Area
Spring Concentration Area
Summer Concentration Area
Fall Concentration Area
165°W
160°W
155°W
150°W
145°W
73°N
72°N
71°N
70°N
69°N
68°N
67°N
ARCTIC OCEAN
Barrow
Wainwright
Atqasuk
Nuiqsut
Prudhoe Bay
Kaktovik
Beaufort Sea
Point Lay
Chukchi Sea
Point Hope
Kivalina
ALASKA
CANADA
UNITED STATES
OCEANA

BOWHEAD WHALES

Bowheads live in the Arctic Ocean and adjacent seas. They spend most of the summer in relatively ice-free waters adjacent to the Arctic Ocean and are associated with sea ice the rest of the year. The Bering-Chukchi-Beaufort, or Western Arctic, population (one of five distinctly recognized populations of bowheads) is currently estimated at 10,500 and is increasing at a rate of 3.2% per year.

Bowhead whale females generally have one calf every three to four years after a gestation period of around 13 to 14 months. The average and maximum lifespan are unknown; however, evidence indicates that individuals can live over 100 years.

The bowhead whale subsistence hunt has a central cultural role in the subsistence way of life of some coastal communities, and it plays an important role in the health and well-being of many Arctic peoples.

The enclosed map depicts seasonal concentration areas for bowhead whales within the proposed 2012-17 Program region. In the spring, bowheads migrate north through the Bering Strait, along the Chukchi Sea coast and over to the eastern Beaufort Sea to feed during the summer. During this migration bowheads concentrate in the spring in the ice lead system along the Chukchi Sea coast, which is where the bowhead whale hunt is conducted by the communities of Point Hope, Point Lay, Wainwright, and Barrow. The Local and Traditional Knowledge of hunters in Barrow and Wainwright describe consistent areas used for feeding and calving where bowheads are concentrated within this migration corridor.

In the fall, bowheads migrate back across the Beaufort Sea along the continental shelf. Hunters have identified consistent feeding concentration areas off the barrier islands in the vicinity of Kaktovik. Bowheads also concentrate in large numbers while feeding in the region around Point Barrow during the migration.

After passing Point Barrow, bowheads then move across the Chukchi Sea, with a fair amount of variability from year to year in where they cross and how quickly they cross. There is some evidence of concentration areas of bowhead whales in the northern Chukchi Sea as they migrate, presumably to take advantage of feeding hot spots. There are also feeding concentration areas in the fall along the Russian coast of the southern Chukchi Sea, before they move through the Bering Strait for the winter. Although only a portion of the study area in the Chukchi Sea is indicated as a fall concentration area, because of the year to year variation in where migration of bowheads cross the Chukchi Sea, in some years other areas than depicted are likely to be important to Bowheads.

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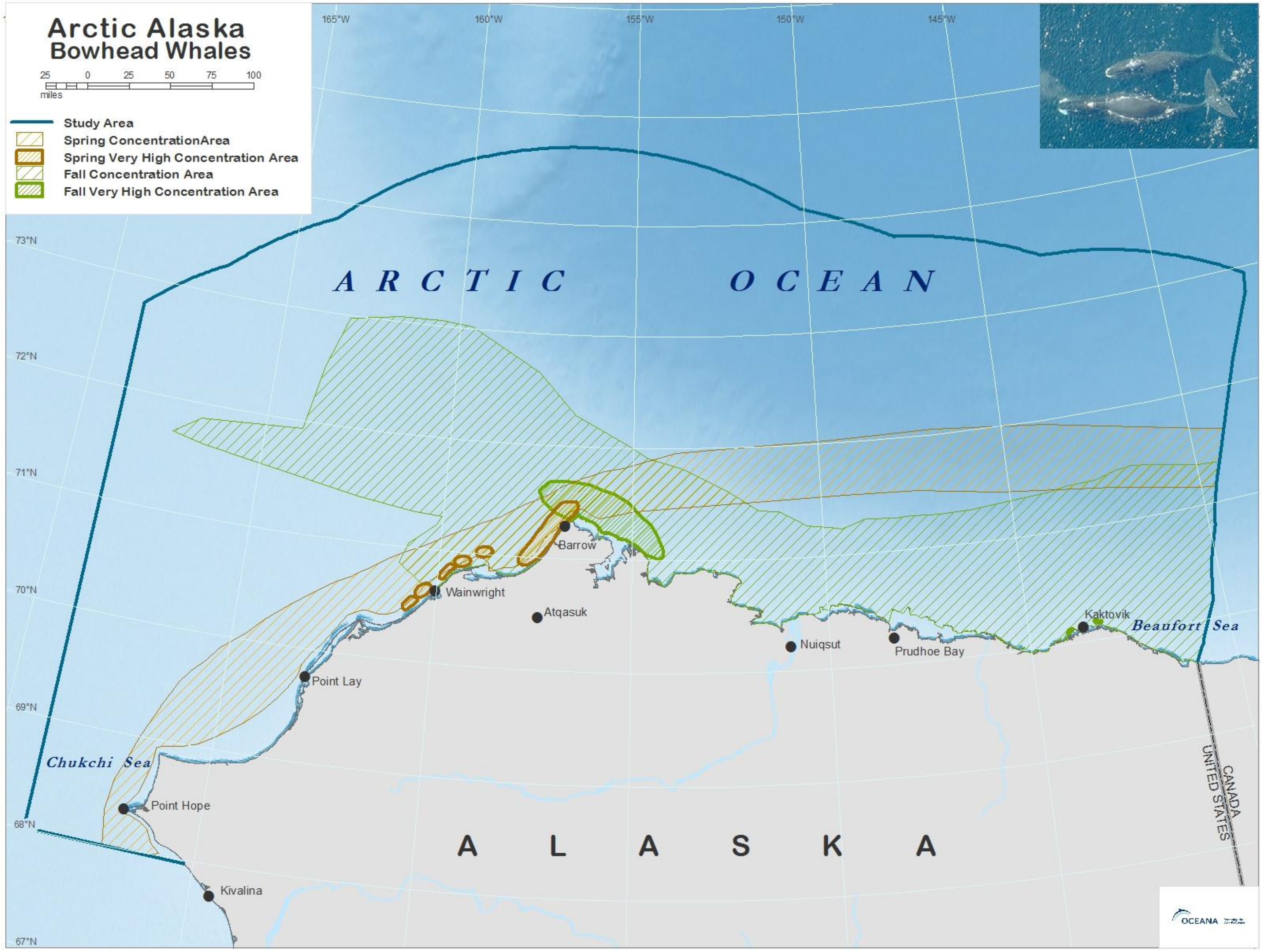
Arctic Alaska
Bowhead Whales
25 0 25 50 75 100
miles
Study Area
Spring ConcentrationArea
Spring Very High Concentration Area
Fall Concentration Area
Fall Very High Concentration Area
165°W
160°W
155°W
150°W
145°W
73°N
72°N
71°N
70°N
69°N
68°N
67°N
ARCTIC OCEAN
Barrow
Wainwright
Atqasuk
Nuiqsut
Prudhoe Bay
Kaktovik
Beaufort Sea
Point Lay
Chukchi Sea
Point Hope
Kivalina
ALASKA
CANADA
UNITED STATES
OCEANA

GRAY WHALES

Gray whales are found mainly in shallow coastal waters in the North Pacific Ocean. Most of the Eastern North Pacific population spends the summer feeding in the northern Bering and Chukchi seas and migrates between those Arctic feeding areas and their winter breeding grounds off the coast of Baja California, Mexico.

Gray whales are frequently observed traveling alone or in small, unstable groups. Large aggregations also may be seen on feeding and breeding grounds. The most recent abundance estimates for Eastern North Pacific gray whales are based on counts made during the 1997/98, 2000/01, and 2001/02 southbound migrations, and range from about 18,000-30,000 animals.

The enclosed map shows summer and fall concentration areas for gray whales in the study area. While gray whales feed primarily in the northern Bering Sea and southern Chukchi Sea, there are a handful of specific concentration areas in the northeast Chukchi Sea, specifically around Point Hope and the Wainwright, Point Franklin, Peard Bay, and Point Barrow.

In addition, aerial surveys conducted between 1982 and 1987 showed concentrations of gray whales in the Hanna Shoal region, which is reflected on the map. While gray whales were not seen consistently in this area in the surveys conducted between 2008 and 2010, it is important to note that the region was not surveyed between 1987 and 2008. Thus, the Hanna Shoal region is not only a potentially important concentration area for gray whales, but it also is a clear example of where gaps in the data reflect the need for further study to better understand the migratory patterns and concentrations of these animals.

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Arctic Alaska
Gray Whales
25 0 25 50 75 100
miles
Study Area
Summer/Fall ConcentrationArea
165°W
160°W
155°W
150°W
145°W
73°N
72°N
71°N
70°N
69°N
68°N
67°N
ARCTIC OCEAN
Barrow
Wainwright
Atqasuk
Point Lay
Nuiqsut
Prudhoe Bay
Kaktovik
Beaufort Sea
Chukchi Sea
Point Hope
Kivalina
ALASKA
CANADA
UNITED STATES
OCEANA

PACIFIC WALRUS

Pacific walrus mainly inhabit the shallow continental shelf waters of the Bering and Chukchi seas, with distribution varying markedly with the seasons. Generally walrus occupy first-year ice with natural openings such as leads and polynyas and are not found in areas of extensive, unbroken ice.

For terrestrial haulouts, isolated sites such as islands, points, spits, and headlands are occupied most frequently. Social factors, learned behavior, and proximity to prey probably influence the location of haulout sites, but little is known about such factors.

The current size of the Pacific walrus population is unknown, and the walrus has the lowest reproductive rate of any pinniped. Pacific walrus breed in the winter between December and March, with calves born in late April or May of the following year. With pregnancies that last through the next breeding season, the minimum interval between successful births for walruses is two years.

The enclosed map depicts summer and fall concentration areas for Pacific walrus. As shown, most of these areas are in the Chukchi Sea, including important terrestrial haul out areas along the northwest coast of Alaska. Walrus primarily feed on clams or other invertebrates that live on and in the sea bottom on shallow continental shelf areas. Thus, their foraging areas are generally limited by depth to continental shelf areas and are focused on areas of high prey availability.

As the sea ice cover retreats north each spring, females, calves and juveniles stay on ice, using it as a resting platform while they feed on the seafloor of the very productive continental shelf in the northern Bering Sea and Chukchi Sea. Males tend to stay in the Bering Sea during this time, hauling out in large numbers at Round Island and elsewhere.

In early summer, females, young of the year and juveniles remain in the Chukchi Sea utilizing the still present sea ice as a resting platform while feeding. As sea ice begins to recede away from the continental shelf in late summer and fall, however, walruses will leave the ice and begin hauling out on shore to remain near the productive feeding areas of the continental shelf.

Walrus are now hauling out in very large numbers consistently on the barrier islands in the Point Lay region and in smaller numbers elsewhere between Point Hope and Point Barrow. In addition, satellite tagging shows walrus also concentrating during this time in the Hanna Shoal region, down to Herald Shoal, and in a band along the Chukchi coast. As sea ice reforms over the Chukchi Sea in the late fall and early winter, walrus move back down into the northern Bering Sea.

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Arctic Alaska
Walrus
25 0 25 50 75 100
miles
Study Area
Summer/Fall High Concentration Haul Out Area
Summer/Fall Haul Out Area
Summer/Fall Concentration
160°W
155°W
150°W
145°W
73°N
72°N
71°N
70°N
69°N
68°N
67°N
ARCTIC OCEAN
Barrow
Wainwright
Atqasuk
Point Lay
Nuiqsut
Prudhoe Bay
Kaktovik
Beaufort Sea
Chukchi Sea
Point Hope
Kivalina
ALASKA
CANADA
UNITED STATES
OCEANA

POLAR BEAR

Polar bears are a large carnivore and a unique symbol of the Arctic. Populations of polar bears are distributed in Alaska, Canada, Greenland, Norway, and Russia, with a worldwide population estimated at 22,000-25,000 bears. Two populations occur in Alaska: the southern Beaufort Sea population, shared with Canada; and the Chukchi-Bering Seas population, shared with the Russian Federation.

Polar bears generally live alone except when concentrating along the coast during the open water period mating or rearing cubs. Polar bears' primary food are ringed seals, but they also hunt bearded seals, walrus, and beluga whales, and they will scavenge on beached carrion such as whale, walrus, and seal carcasses found along the coast.

Polar bears give birth to one to three cubs in December or January, and cubs remain with their mother for a little more than two years. Pregnant females will enter maternity dens in October or November; in Alaska, dens are excavated on either sea ice or on land.

The enclosed map shows fall, winter and spring concentration areas for polar bears within the study area. Along with the more general fall concentration area, winter concentration areas are divided into subsections to reflect important locations for activities like denning.

Both the Chukchi-Bering Sea and southern Beaufort Sea polar bear populations are found in the Program Area, with distribution influenced by season, ocean currents, ice and weather observations and availability of seals. Polar bears move seasonally with the ice edge, using the ice as a platform for hunting, feeding, breeding and movement. They are most abundant near coastlines and the southern extent of the ice pack. With low sea ice cover in early fall, polar bears have been found in coastal areas, with higher densities of bears in the study area being found between Prudhoe Bay and the Canadian border.

In winter, polar bears stay along the coast, usually as far south as Saint Lawrence Island. Dens can be found on the Chukchi and Beaufort Sea coast, but denning is more concentrated along the Beaufort coast, especially near the Arctic National Wildlife Refuge. Pregnant females and newborn cubs den from late November to early April, with barrier islands particularly important for denning. Those barrier islands were designated as winter concentration areas on the enclosed map. The winter and spring concentration areas also show polar bear feeding areas, which is from documented Local and Traditional Knowledge of coastal villagers.

For fall, the map depicts the core use area of polar bears in the study region from Armstrup et al. 2005. In the summer polar bears are generally found offshore following the receding pack ice in the Arctic, with individual bears roaming over very large areas. Locations of bowhead whale bone piles from subsistence hunts by the villages of Barrow, Nuiqsut and Kaktovik are included in each season as they are attraction areas for polar bears.

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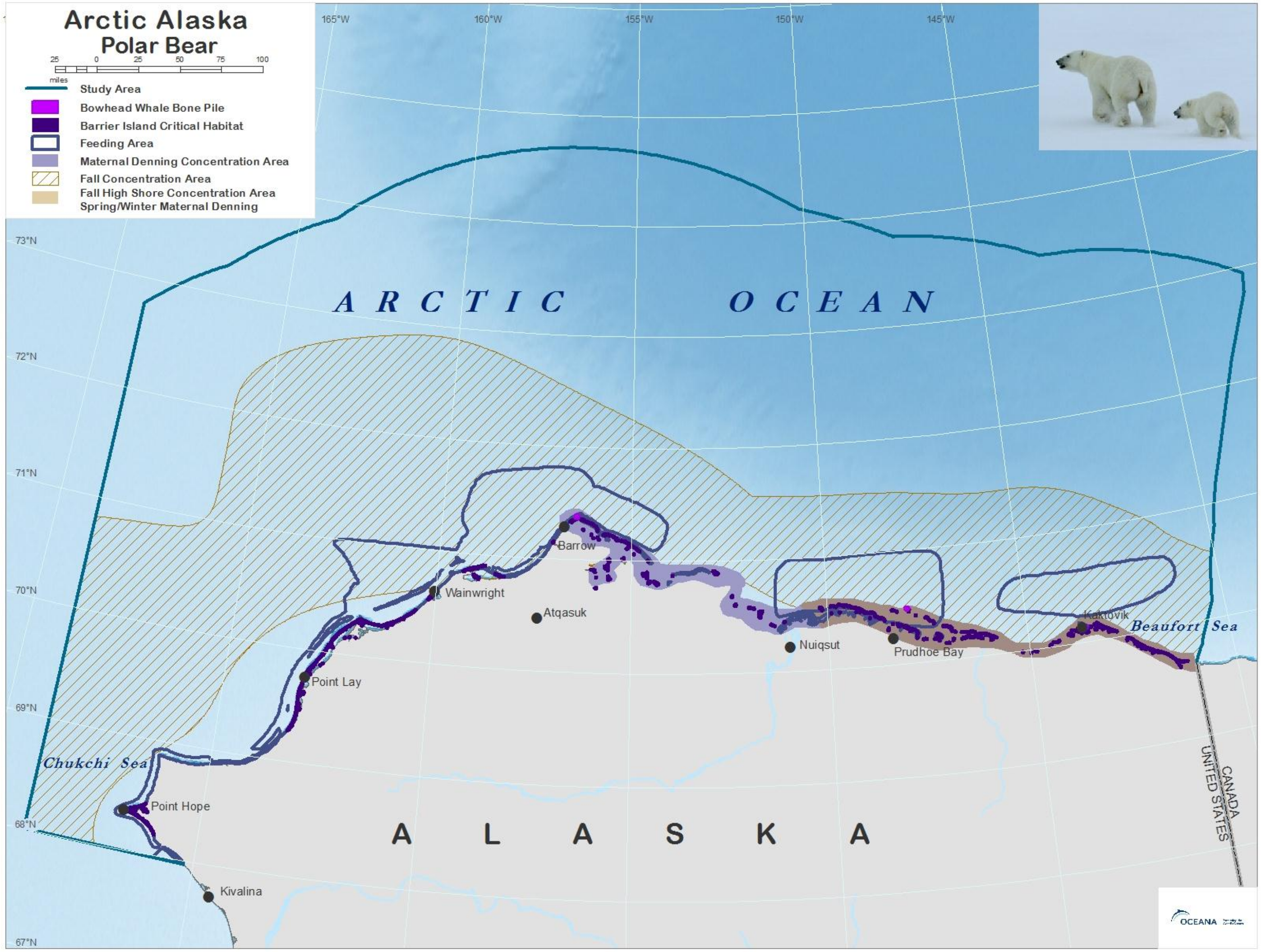
Arctic Alaska
Polar Bear
25 0 25 50 75 100
miles
Study Area
Bowhead Whale Bone Pile
Barrier Island Critical Habitat
Feeding Area
Maternal Denning Concentration Area
Fall Concentration Area
Fall High Shore Concentration Area
Spring/Winter Maternal Denning
165°W
160°W
155°W
150°W
145°W
73°N
72°N
71°N
70°N
69°N
68°N
67°N
ARCTIC OCEAN
Barrow
Wainwright
Atqasuk
Nuiqsut
Prudhoe Bay
Kaktovik
Beaufort Sea
Point Lay
Chukchi Sea
Point Hope
Kivalina
ALASKA
CANADA
UNITED STATES
OCEANA

RIBBON SEALS

Ribbon seals inhabit the North Pacific Ocean, specifically the Bering and Okhotsk seas, and parts of the Arctic Ocean, including the Chukchi, eastern Siberian, and western Beaufort seas. They are strongly associated with sea ice for mating, whelping pups and molting, and for the rest of the year they are pelagic and wide ranging across much of the Bering Sea, north Pacific and Chukchi Sea.

Ribbon seals become sexually mature after 3-5 years. Adult ribbon seals produce one offspring per year, and gestation lasts 11 months. They breed in May and give birth the following year between late March and April. Molting occurs annually, typically between March and June; juveniles molt earlier and adults molt after giving birth. On average, ribbon seals live for about 20 years, but can reach up to about 30 years.

In the latest stock assessment (2007), NMFS estimated a global population size of 240,000 ribbon seals, 90,000-100,000 of which inhabit the Bering Sea.

Habitat selection by ribbon seals can be broadly divided into two seasonal periods. In spring and early summer ribbon seals are engaged in whelping, nursing, breeding, and molting, all of which take place on and around sea ice where the seals haul out. During these months ribbon seals are concentrated in the ice front or “edge zone” of the seasonal pack ice, typically in the central and western Bering Sea.

During May and June, ribbon seals spend much of the day hauled out on ice floes while weaned pups develop self-sufficiency and adults complete their molt. As the ice melts, seals become more concentrated, with at least part of the Bering Sea population moving towards the Bering Strait and the southern part of the Chukchi Sea.

Once molting is complete ribbon seals leave the ice and spend most of their time in open water. During this time they are wide-ranging, capable of deep dives of more than 500 meters, and rarely haul out on the ice. Relatively little is known about the distribution or concentrations of ribbon seals during this time. Recent satellite tagging indicates a fraction of the ribbon seals migrate into the central Chukchi Sea for the summer and fall (the southwest corner of the area in the Arctic under consideration in the Five Year Plan).

While some ribbon seals remain in the Chukchi Sea until the return of the sea ice in late fall pushes them back into the Bering Sea, more information needs to be gathered to better understand their distribution. One important note is that unlike some other seal species ribbon seals are not well adapted for maintaining breathing holes in winter sea ice, making it clear they need to move south for the winter.

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Arctic Alaska
Ribbon Seal
25 0 25 50 75 100
miles
Study Area
Summer/Fall Concentration Area
165°W
160°W
155°W
150°W
145°W
73°N
72°N
71°N
70°N
69°N
68°N
67°N
ARCTIC OCEAN
Barrow
Wainwright
Atqasuk
Nuiqsut
Prudhoe Bay
Kaktovik
Beaufort Sea
Point Lay
Chukchi Sea
Point Hope
Kivalina
ALASKA
CANADA
UNITED STATES
OCEANA

RINGED SEALS

Ringed seals reside in Arctic waters and are commonly associated with ice floes and pack ice. They are solitary animals and when hauled out on ice separate themselves from each other by hundreds of yards. During the spring breeding season females construct lairs within the thick ice and give birth to a single pup in March or April. Ringed seals live about 25 to 30 years, and the estimated population size for the Alaska population of ringed seals is 249,000 animals. The population trend for the Alaska stock is unknown.

Ringed seals are well adapted to occupying seasonal and permanent ice. They tend to prefer large floes and are often found in the interior ice pack where the sea ice coverage is greater than 90%.

Surveys in late winter and spring indicate ringed seal densities and concentration areas are most numerous in nearshore fast and pack ice. In particular, surveys from the Beaufort Sea indicate that densities tend to be highest around the fracture zone between the fast ice and the pack ice.

Satellite tagging of ringed seals indicates that ringed seals often disperse broadly for the open water period in the summer and fall, presumably to forage in highly productive areas. Unfortunately, data is limited on where there may be foraging concentration areas within the study area. This is another example of the kind of information that is sorely needed to fully assess the impacts of any offshore development.

The enclosed map shows the winter and spring concentration area for ringed seals.

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Arctic Alaska
Ringed Seal
25 0 25 50 75 100
miles
Study Area
Spring/Winter Concentration Area
165°W
160°W
155°W
150°W
145°W
73°N
72°N
71°N
70°N
69°N
68°N
67°N
ARCTIC OCEAN
Barrow
Wainwright
Atqasuk
Nuiqsut
Prudhoe Bay
Kaktovik
Beaufort Sea
Point Lay
Chukchi Sea
Point Hope
Kivalina
ALASKA
CANADA
UNITED STATES
OCEANA

SPOTTED SEALS

Spotted seals prefer Arctic or subarctic waters, and they are often found within the outer margins of shifting ice floes. Rarely do they inhabit areas of dense pack ice. Spotted seals range from the coast of Alaska throughout the Bering Sea, Sea of Japan, and Sea of Okhotsk.

During breeding season between January and mid-April spotted seals haul out on ice floes, whereas during the summer months they can be found in the open ocean or hauled out on shore. Pup births peak in mid-March. The estimated population size for the Alaska stock of spotted seals is 59,000 animals. The population trend is unknown.

The enclosed map shows summer and fall concentration areas for spotted seals. In summer and early fall, spotted seals use coastal haul outs regularly, especially on barrier islands in several locations in the study area. Individual seals can make extensive foraging trips, as long as 1000 kilometers, from these haul out concentration areas.

As sea ice forms in the fall and winter, spotted seals and other ice-dependent animals retreat south back into the Bering Sea, typically crossing through the Bering Strait in November. During the winter spotted seals are found along the ice edge in the Bering Sea. In spring they prefer smaller ice floes along the southern margin of the sea ice and move to coastal habitats after the retreat of the sea ice.

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Arctic Alaska
Spotted Seal
25 0 25 50 75 100
miles
Study Area
Summer/Fall Concentration Area
165°W
160°W
155°W
150°W
145°W
73°N
72°N
71°N
70°N
69°N
68°N
67°N
ARCTIC OCEAN
Barrow
Wainwright
Atqasuk
Point Lay
Nuiqsut
Prudhoe Bay
Kaktovik
Beaufort Sea
Chukchi Sea
Point Hope
Kivalina
ALASKA
CANADA
UNITED STATES
OCEANA

SEASONAL MAPS

As described earlier, along with the maps showing seasonal concentration areas for each Arctic marine mammal species, we are also providing the following four maps that aggregate those concentration areas for all species during particular seasons. These maps provide another way of looking at the data about concentration areas. They also identify those overlapping seasonal concentration areas where, based on information available now, further study and extra caution is required to minimize any impact from offshore oil and gas activities.

As reflected on each species map, Arctic marine mammals move with the seasons. Sea ice cover, mating and calving behavior, availability of food for predators, protection for prey animals, availability of good haul out locations and a number of other factors contribute to the seasonal movements and concentration areas for individual species.

In the winter months, there are a number of marine mammal species that leave the Chukchi and Beaufort seas altogether, as they only are present to take advantage of the burst of summer productivity. A good example is the seasonal migration of gray whales, which come north to the Arctic to feed in the summer months and move south as far as Baja California to breed and calve in warmer waters in the winter.

There are some species, however, that remain in the winter—primarily polar bears and ringed seals—although there are overwintering bearded seals and there is documentation of gray whales overwintering as well. As reflected in the winter concentration areas map, the most important places for those marine mammals during the Arctic winter months are coastal areas and fast and nearshore pack ice along the Beaufort and Chukchi coasts.

As winter turns to spring, a host of species comes back to the region. A corridor of water opens up along the sea ice edge along the Chukchi coast consistently. This corridor is the pathway that tens of thousands of beluga whales, bowhead whales, seabirds and other animals use to return to the Beaufort and Chukchi seas. Hunters use this consistent and productive migration corridor extensively for subsistence. Impacts to this corridor could have important and far reaching consequence for the Beaufort and Chukchi large marine ecosystems.

As spring turns to summer, sea ice begins to retreat into the high Arctic, and the rest of the region's seasonal marine mammals return. Walrus, spotted seals and gray whales enter the Chukchi and Beaufort seas, and the increase in activity as summer wears on stands in stark contrast to the leaner, harsher months of winter.

While marine mammals are found throughout the study area during the summer, the coastal region along the Chukchi Sea coast remains particularly important for marine mammals for feeding, haul outs and other uses. The enclosed map highlights some particular areas where large numbers and a wide variety of animals are concentrated during summer. For example, beluga whales congregate in the area around Omalik lagoon, reaching their peak in late June. Kasegaluk Lagoon near Point Lay is very important for that community's beluga subsistence hunt, and also an abundant area for spotted seals and walrus haul outs.

Whales also gather in the Barrow Canyon and the Point Franklin regions to feed, with concentrations areas of belugas and gray whales. As the ice continues to recede throughout the summer, Hanna Shoal begins to become more important for marine mammals, with walrus in particular utilizing the region.

While summer is a busy time for marine mammals in the Arctic, the activity truly peaks as summer turns to fall. Sea ice reaches its annual minimum each September, and marine mammals are actively foraging in the open water, finding as much nutrition as possible to survive the long migration or lean Arctic winter ahead. Along with the frenzy of feeding, fall also is when gray whales and other species begin departing for warmer water farther south. Animals that migrated to the eastern Beaufort Sea move back through the study area on their journey to more southern latitudes, feeding along the way.

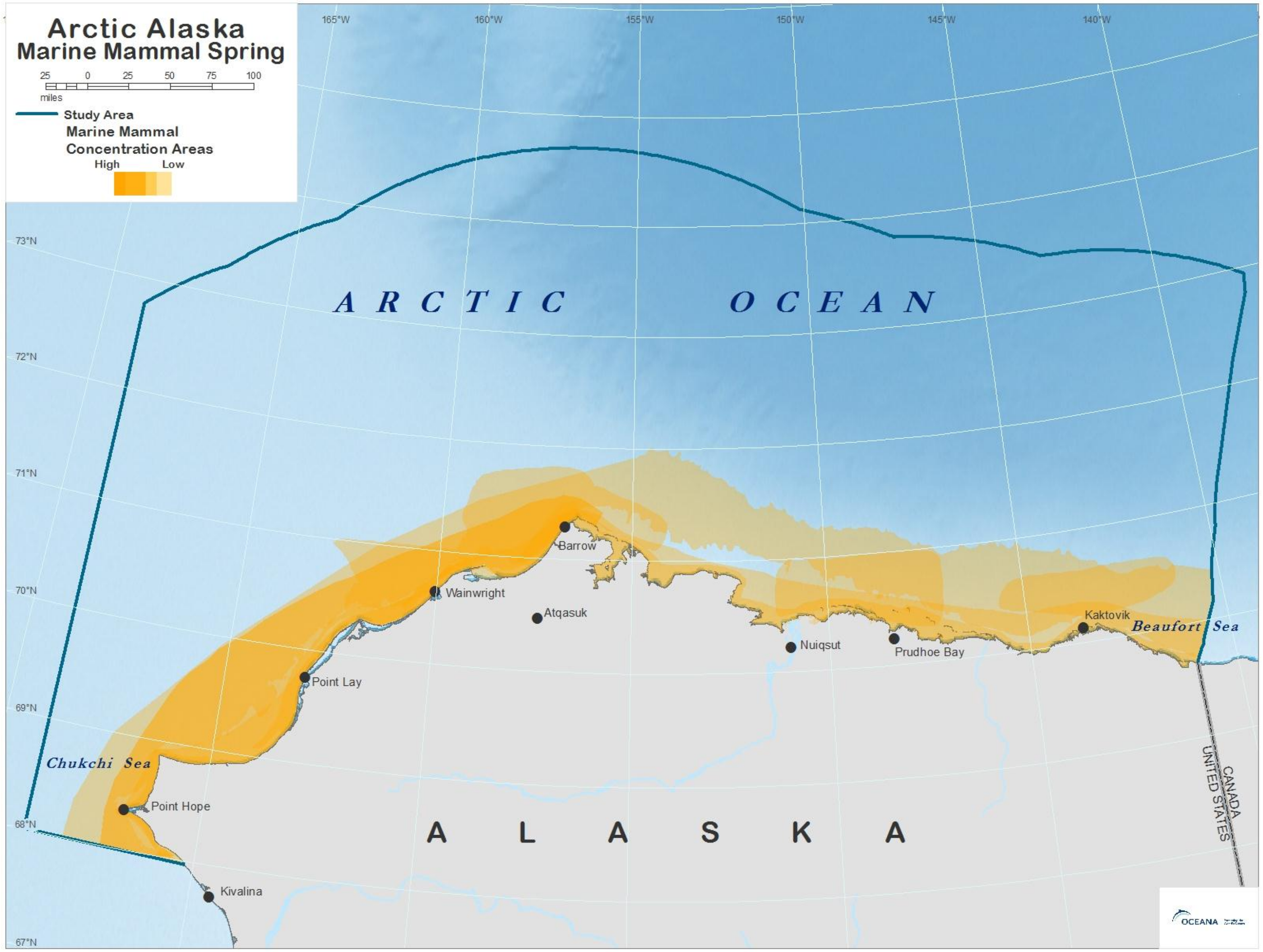
The fall map reflects this combination of feeding and seasonal migrations. The Beaufort shelf and shelf break are important migration and feeding corridors for bowheads and belugas. The Barrow Canyon and Point Barrow area and areas south to Peard Bay and Point Franklin are hotspots for feeding of bowhead, beluga, and gray whales, as well as walrus.

In addition, Kasegaluk Lagoon and its barrier islands remain important with massive haul outs of walrus, as well as being an important area for spotted seals hauling out. Hanna Shoal also continues to play a key role for foraging walruses, feeding and migrating bowhead whales, and foraging gray whales.

Clearly, even this limited analysis of only eight species shows not only many important areas to be protected, but that there is much more work to be done to understand the complex Arctic marine ecosystems. Without that understanding, we risk irreversible harm from decisions about moving forward with industrial activities. Department of Interior must consider this and more information in its analyses.

Given the proven risks and potentially grave consequences of oil and gas activities in the Arctic there should not be Arctic lease sales in the 2012-2017 Five Year Plan. The region should be deferred from all oil and gas activities unless and until there is a plan in place that shows those activities can be conducted without harming the health of the ecosystem or opportunities for the subsistence way of life.


Arctic Alaska
Marine Mammal Winter
25 0 25 50 75 100
miles
Study Area
Marine Mammal
Concentration Areas
High
Low
165°W
160°W
155°W
150°W
145°W
140°W
73°N
72°N
71°N
70°N
69°N
68°N
67°N
ARCTIC OCEAN
Barrow
Wainwright
Atqasuk
Nuiqsut
Prudhoe Bay
Kaktovik
Beaufort Sea
Point Lay
Chukchi Sea
Point Hope
Kivalina
ALASKA
CANADA
UNITED STATES
OCEANA


Arctic Alaska
Marine Mammal Spring
25 0 25 50 75 100
miles
Study Area
Marine Mammal
Concentration Areas
High
Low
165°W
160°W
155°W
150°W
145°W
140°W
73°N
72°N
71°N
70°N
69°N
68°N
67°N
A R C T I C
O C E A N
Barrow
Wainwright
Atqasuk
Nuiqsut
Prudhoe Bay
Kaktovik
Beaufort Sea
Point Lay
Chukchi Sea
Point Hope
Kivalina
A L A S K A
UNITED STATES
CANADA
OCEANA


Arctic Alaska
Marine Mammal Summer
25 0 25 50 75 100
miles
Study Area
Marine Mammal
Concentration Areas
High
Low
165°W
160°W
155°W
150°W
145°W
140°W
73°N
72°N
71°N
70°N
69°N
68°N
67°N
ARCTIC OCEAN
Barrow
Wainwright
Atqasuk
Nuiqsut
Prudhoe Bay
Kaktovik
Beaufort Sea
Point Lay
Chukchi Sea
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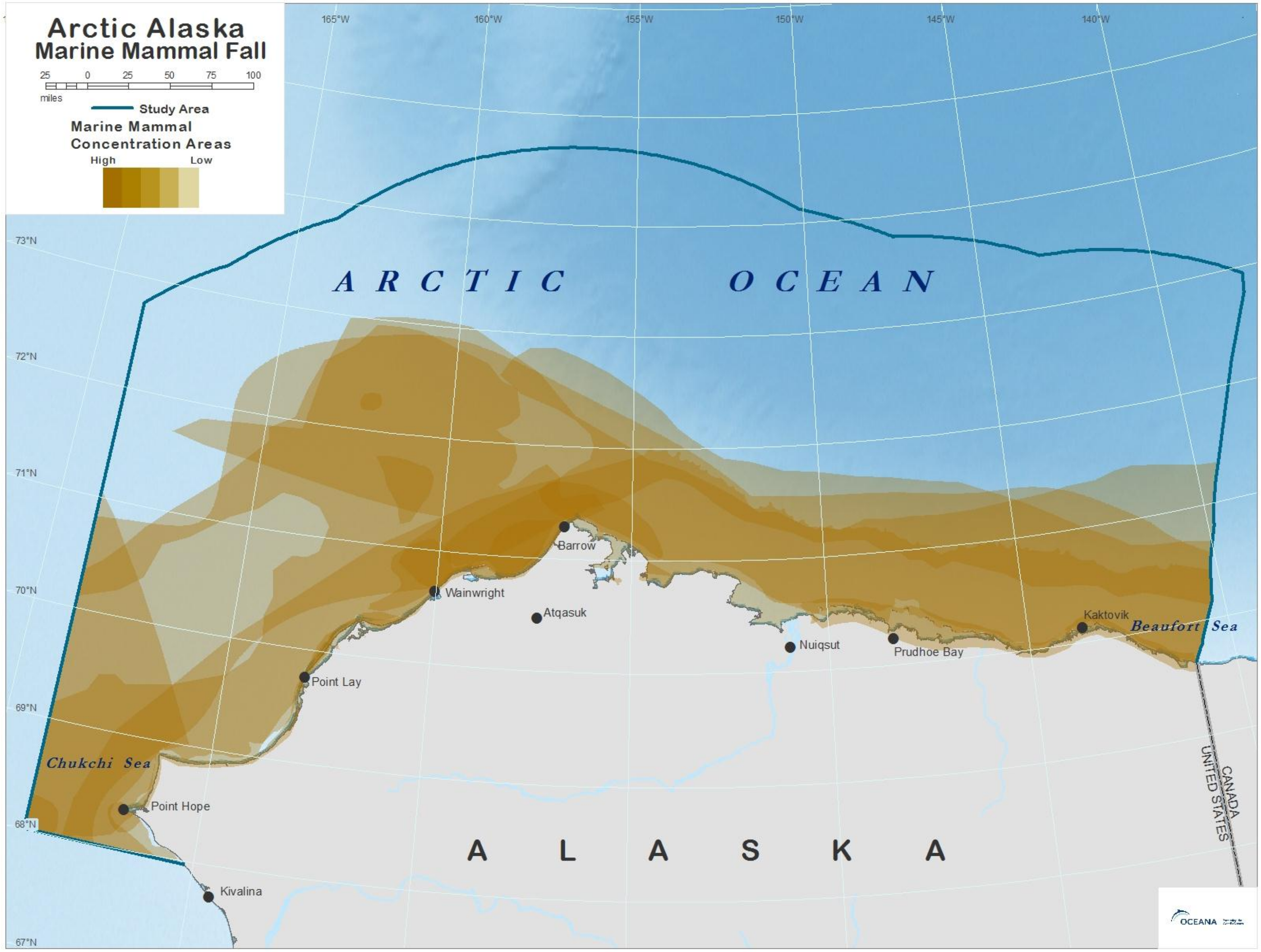
Arctic Alaska
Marine Mammal Fall
25 0 25 50 75 100
miles
Study Area
Marine Mammal
Concentration Areas
High
Low
165°W
160°W
155°W
150°W
145°W
140°W
73°N
72°N
71°N
70°N
69°N
68°N
67°N
ARCTIC OCEAN
Barrow
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