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Committee on Energy and Natural Resources

"Environmental Stewardship as it Relates to Offshore Oil and Gas Development"

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Good morning. I am the Pacific Science Director for Oceana, an international marine conservation organization dedicated to using science, law, and policy to protect the world's oceans. Oceana's headquarters are in Washington, DC, and we have offices in five states as well as Belgium, Belize, Spain, and Chile. Oceana has 300,000 members and supporters from all 50 states and from 150 countries around the globe.

Prior to joining Oceana, I spent more than 30 years as an environmental chemist studying oil pollution fate and effects as an employee of the National Oceanic and Atmospheric Administration (NOAA). In that role, I led numerous studies on the *Exxon Valdez* oil spill beginning a week after the incident through my retirement from NOAA in November 2008. I have a Master of Science degree in chemistry, and I wrote the doctoral dissertation for my PhD in fisheries on data generated by the spill. With more than 50 professional papers on the *Exxon Valdez* oil spill and related topics, I have advised governments in Canada, China, Korea, Norway and Russia on oil pollution issues.

Our oceans are places of wonder and beauty, and they provide important services that we want and need. Oceans are our largest public domain and house biological riches that surpass those of our national forests and wilderness areas. Oceans provide oxygen we breathe, food we eat, medicines we need, and aesthetic and spiritual nourishment. Healthy oceans and coastal ecosystems are also economic engines that provide valuable jobs, energy resources, and recreation and tourism opportunities. Simply put, oceans are essential to our lives and livelihoods.

While I understand that the purpose of this hearing is to discuss environmental stewardship as it relates to offshore oil and gas production, I must state for the record that Oceana opposes expanded offshore oil and gas development. We and so many other environmental organizations take this position because we believe the environmental risks poorly are understood and are not justified by the potential economic benefits. The current lack of baseline information combined with the broad suite of toxicological risks, both known and emerging, requires responsible stewards to embrace a much higher standard of precaution in considering the risks associated with oil and gas development. We, therefore, believe that the potentially irreversible effects of oil pollution on marine ecosystems and their dependent economies do not warrant the questionable, and in any case short-term, economic benefits that might be gained from offshore oil and gas development.

That said, Oceana and other conservation groups do support better stewardship for our oceans, and we appreciate the fact that the Committee has framed this hearing in those terms. As we

consider any industrial activities in the ocean—oil and gas, shipping, fishing, alternative energy development—our first step should be to understand and protect the marine environment and those dependent on it. Once we understand the functioning of the ecosystem, we can better predict how activities might affect it and, therefore, undertake a true stewardship and planning effort.

Too often, this is not the case. Large oil development proposals in the marine environment are presented and discussed as engineering challenges, without sufficient regard for the complexity of the environment in which they would occur, or the often dubious assumptions implicit in assessments of environmental risks and mitigation technologies. Oil spill contingency plans are presented as exercises in damage control, taking for granted that not all damage can be controlled, and based on the faulty assumption that the important variables and their interactions are adequately understood, predictable, and manageable. Similarly, the methods used to evaluate mitigation technologies in the field usually do not meet basic scientific principles, so that the results, and hence risk assessments based on them, are inherently questionable. In truth, our understanding of how oil behaves in the environment, the ways it affects organisms, and how well response and mitigation measures actually work in the field is still in its infancy. That fact alone argues for an especially precautionary approach to offshore oil and gas development.

For example, following the 1989 *Exxon Valdez* oil spill, scientists and spill response managers assumed that oil would be most persistent in the uppermost parts of the intertidal zone because oil from the spill would be more likely to adhere to the sediments there.[1] Four years after the incident, beach cleanup and monitoring were terminated, because hardly any oil was still evident in the upper portion of the intertidal zones, either on beach surfaces or beneath.[2] Subsequently, however, residents of the area repeatedly reported finding oil lower down in the intertidal zone and just below the beach surface. Sometimes enough oil was found to support combustion. Finally in 2001, I led a rigorous, quantitative study that involved no assumptions about where on a beach oil might be found. That study showed that most of the remaining oil was in the more biologically productive mid-tide portion of the beach.[3]

As it turned out, the policy decision to end cleanup and beach monitoring was largely based on unverified assumptions that went unquestioned for 9 years. Over the last 20 years, scientists have definitively proved false similarly naive assumptions regarding the ways in which oil components exert their toxic effects,[4] the identities of many of the compounds that are known to be toxic,[5] the processes that affect the persistence of oil in the environment once released,[6] the efficacy of response and mitigation technologies,[7] and the ecological impacts from disturbances associated with offshore oil and gas development.[8] Each time one of these assumptions is proven incorrect, it reinforces the fact that there is a great deal that we do not know about these issues.

This information is important because the risk assessments we undertake for oil and gas activities are, by definition, based on what we *do* know and what we assume. Given the fact that we have been wrong so many times before, we can rest assured that such assessments understate the actual likelihood of serious environmental impacts.

Given the fundamental nature of the scientific uncertainties that remain, we should expect more unwelcome surprises regarding the environmental impacts of offshore oil and gas development in the future. While we have a better idea of what questions to ask scientifically, we have also learned that there are likely to be impacts that we do not know how to detect, let alone mitigate, because we do not even know what they might be. The prudent management response is not to pretend that such impacts do not exist, but to conduct the necessary research, account for uncertainty, and embrace truly precautionary, science-based regulation. Along these lines, I recommend to you the following principles:

First, decisions about development, such as oil and gas activities should be made in the context of a plan that prioritizes protecting marine ecosystems and the services they provide. Decisions about industrial activities must be based on sound science, planning, and precaution. Critical habitats and processes, including important ecological areas should be identified and appropriate protective measures adopted for them as a predicate to development.

Second, to make effective decisions about whether industrial activities should occur and, if so, when, where, and how, we need to know what is in the ocean as well as how the marine ecosystem is structured and functions. In the aftermath of the *Exxon Valdez* spill, consequences for populations of impacted species were often obscured because we did not have a sufficient picture of the pre-impact population sizes. Similarly, the massive development in the Gulf of Mexico occurred with scant attention to the status of the ecosystem beforehand. As a result, claims that oil and gas development has had little effect on marine life in the Gulf of Mexico ring hollow. Although we know that these marine ecosystems have changed considerably, we cannot demonstrate exactly how because we did not establish quantitatively what was there before the development occurred. Without such baseline knowledge about what is in the ocean and how it interrelates, we cannot legitimately evaluate risks prior to industrial activities, and we risk being in the position of wondering what was lost following development or an industrial accident because we did not evaluate what was there to begin with. Yet, that is the current situation in most of the areas where expanded oil and gas drilling has been proposed—there simply is not sufficient ecological baseline information to adequately evaluate or mitigate risks. In the Arctic Ocean, for example, a massive expansion of oil and gas leasing has been authorized despite a paucity of scientific data about the marine ecosystem.

To better understand the risks and to provide a baseline for decision makers, quantitative assessments of the major ecosystem components as well as ecological studies to provide a basic understanding of the food-web interactions that support them or are affected by them should be conducted prior to authorizing oil and gas activities. These studies should include baseline surveys of pollutants, pre-development population assessments of species at greatest risk, such as seabirds and marine mammals, and studies on their seasonal and spatial variability.

For large-scale projects, the adequacy of these pre-development surveys should be evaluated by an independent panel of experts. Although the Minerals Management Service has expended considerable sums on studies, they were not guided by an integrated ecosystem research plan. As a result, population and distribution data for several vulnerable species that play important roles in the marine ecosystem are either outdated or missing. In contrast, careful formulation of

integrated ecosystem research and monitoring plans, such as the Gulf Ecosystem Monitoring plan in Alaska formulated in the aftermath of the *Exxon Valdez* oil spill,[9] may furnish more useful information at a fraction of the cost.

Third, the status of key and vulnerable ecosystem components should be monitored over the course of development and subsequent production, so that natural trends and variability can be given due consideration when evaluating oil and gas impacts. Any important but poorly-understood ecological processes identified during the pre-development surveys and subsequent review should be studied in sufficient detail to elucidate and remedy the defects in our understanding. These on-going research and monitoring programs should be tailored to the respective regions where new development is proposed and overseen by an independent body comprising concerned local interests, such as the Regional Citizens' Advisory Councils envisioned in the Oil Pollution Act of 1990. The results of these efforts should be made publicly available not only through websites and publications, but also periodic science symposia in respective ecosystem regions. Funding for these endeavors should be provided largely by those seeking to develop oil and gas leases. An oil spill risk assessment as outlined in S. 1564 introduced by Senator Begich should be a first step to determining if spill clean up is possible and under what conditions.

Fourth, best available technology must be used, and proposed incident response and recovery methods be fully developed and readily available. These mechanisms must be demonstrated to be effective in the region where new oil and gas development is proceeding, not in some warehouse thousands of miles away, and under realistic environmental conditions in field tests. Oil spill response and recovery plans often rely on dispersants, for example. At this time, however, we have not developed a reliable and scientifically rigorous method for measuring the proportion of oil actually dispersed that did not, and would not, have temporarily disappeared because of wave action only to re-aggregate unmeasured elsewhere.[7] Once a reliable method for performance evaluation is in hand, it should be applied in field tests to determine dispersant efficacy under a realistic range of temperatures, sea surface salinities and agitation, and oil types, viscosities and slick thicknesses. Similar concerns apply for *in situ* burning. For mechanical recovery, we need to know how well the proposed techniques can be expected to work in various states of the seas and winds, and for what fraction of the time they can even be deployed successfully. In the Arctic, it has been widely recognized that mechanical recovery is impossible in icy conditions, and it would be useful to know whether such response measures could even be deployed during the long Arctic night.

A necessary component of these response and recovery methods is adequate infrastructure. We must ensure that all vessels are subject to tracking and that response and recovery equipment is stationed in accessible locations.

We also must insist that impacts from the exploration process, production wastes, and other pollution are minimized. Exploration for oil, which involves seismic testing, can be harmful to many species of endangered and threatened species including marine mammals, sea turtles and fish.[10] While we believe these impacts are unjustified in any areas that were previously set aside or protected, as well as in highly sensitive areas such as the Arctic, responsible environmental

stewardship requires that these impacts at least be minimized by careful timing and choosing locations where these species are not present. Production wastes, such as drilling muds and produced waters also harm marine ecosystems.[11] Methods should be developed to treat these wastes prior to releasing them into the environment, or they should not be released at all. Similarly, emissions of air and water pollutants must be minimized by requiring new and better technology, and the introduction of invasive species must be strictly prohibited.

Fifth, we should insist on adequate pre-development social and economic research to evaluate subsistence and local use of the ocean in respective ecosystems. As we have seen with beach communities and fishery economies following oil spills and other ocean pollution events, just the perception that seafood could be tainted can lead to devastating market losses for commercial fishers and tourism providers and even more profound disruptions of communities that rely on subsistence for the main supply of food, as is often the case with Alaska Natives. Research before development is the only way to accurately account for these risks in the decision making process.

Sixth, increased dedicated funding should be provided to the National Oceanic and Atmospheric Administration and through the National Science Foundation to support research on the toxicology of petroleum and petroleum products and their interactions with other contaminants. NOAA in particular has done pioneering work discovering heretofore unanticipated biochemical mechanisms through which petroleum can poison marine biota, such as the embryotoxic effects of certain polycyclic aromatic hydrocarbons (PAH) on fish eggs and the interaction of PAH with sunlight to dramatically increase toxicity.[4] Funding for this work should be broadened to include research aimed at identifying toxic compounds in petroleum that now remain obscure, as well as the biochemical mechanisms causing their toxic effects. The research methods developed at NOAA in these fields over the last decade hold great promise for producing more discoveries of fundamental value regarding responsible environmental stewardship.

The funds needed to address all of the concerns listed above amount to a small fraction of likely revenues generated by new oil production. In fact, allocating just 1% of the revenues resulting from expanded offshore oil and gas production would amount to an enormous increase over current funding levels. Currently, the national oil-spill research plan is more than 10 years old, and of the $28 million annually authorized to fund it, only about a fourth is actually spent.[12] In contrast, Norway has spent the equivalent of $10 million on new oil-spill technologies alone since 2006,[12] and it produces less than a third of the petroleum that the United States does.[13] Truly responsible environmental stewardship would include substantial funding increases to better support research in all aspects of the environmental impacts of offshore oil and gas development.

Moreover, the provision of adequate funding would address a chronic asymmetry in the scientific standards used to evaluate the environmental impacts of offshore oil and gas development. Paying inadequate attention to pre-development surveys, ecosystem process and monitoring studies, and ecotoxicological research, has crippled our ability to detect impacts. This failure exacerbates the likelihood of ill-advised policy recommendations. By contrast, there are rigorous

standards typically applied to demonstrations of impacts from development. By acquiescing to defective standards prior to impacts but insisting on rigorous standards to demonstrate them afterward, we create a substantial bias that works to promote environmental harm. This bias could be considerably reduced simply by insisting on rigorous and adequately comprehensive pre-development surveys, as well as monitoring over the economic life of approved projects. There should be enough science to have a reasonable chance of detecting population-level effects that might result from plausible impacts associated with development within the associated region.

Finally, new oil and gas activities should occur only as part of a plan to move toward alternative, renewable energy. We can all recognize that the country must undergo a shift to renewable energy. New oil and gas activities must only be undertaken as a bridge to that future. We must ensure that decisions are made and revenues allocated in such a way to move us closer to renewable energy and sustainable living.

In closing, I cannot overemphasize the fact that marine ecology is still a developing science, with new, fundamental discoveries coming on a regular basis, and that the science of oil pollution effects is still in its infancy. We are never quite sure how oil will behave once released, where it will eventually find its way, how it may interact with other pollutants, or even all the ways it can harm marine life. When we make the effort to look closely, such as happened after the *Exxon Valdez* spill, fundamental surprises typically come to light. These discoveries overturn predictions of impacts often stated with unfounded confidence beforehand that in retrospect turn out to have been based on little more than conjecture. The record of new toxicity mechanisms that continue to be discovered, along with longstanding evidence of toxic effects that are clearly related to oil exposure but that cannot be explained on the basis of what we currently know about the toxicity of oil components, virtually guarantees that toxic impacts occur in the environment that we do not even know how to detect. Recognition of this requires us to embrace a much higher standard of precaution as we consider the risks associated with oil and gas development. It is largely on the basis of this recognition that we at Oceana, along with most of the marine conservation community, believe that the potentially irreversible effects of oil pollution on marine ecosystems and their dependent economies do not justify the potential short-term economic gains that might accrue from offshore oil and gas development.

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