



By U.S. Mail and Email

May 10, 2006

Rance R. Wall
Minerals Management Service
"Comments on Draft PEA"
3801 Centerpoint Dr., Suite 500
Anchorage, AK 99503-5823

Email: AKwebmaster@mms.gov

Re: Draft Programmatic Environmental Assessment for Arctic Ocean Outer Continental Shelf Seismic Surveys - 2006

Dear Mr. Wall:

On behalf of the Natural Resources Defense Council ("NRDC"), Earthjustice, Pacific Environment, Northern Alaska Environmental Center, Alaska Wilderness League, Alaska Coalition, The Wilderness Society, Alaska Oceans Program, Center for Biological Diversity, World Wildlife Fund, Oceana, Trustees for Alaska, Cook Inletkeeper, and our millions of members, we are writing to submit comments on the Minerals Management Service's ("MMS") Draft Programmatic Environmental Assessment for Arctic Ocean Outer Continental Shelf Seismic Surveys – 2006 ("PEA").¹ For the reasons discussed in detail below, we believe that the PEA fails to meet the environmental review standards prescribed by the National Environmental Policy Act ("NEPA"), 42 U.S.C. 4321 *et seq.*, and we have very serious concerns about the impacts of your proposal to marine life and Native communities.

The seismic surveys you propose for the Chukchi and Beaufort Seas would introduce into the marine environment some of the loudest sounds generated by humans, criss-crossing these waters with airguns that fire every 10-15 seconds. PEA at 6. They are scheduled to occur over a period of many months, during the migration of endangered bowhead whales and in the habitat of beluga whales, humpback whales, fin whales, and other species that rely heavily on sound for critical life functions such as feeding, migrating, and caring for their young. In the Chukchi, which is prime bowhead habitat, the 3D

¹ Comments may be submitted independently by government agencies, individual scientists, other environmental organizations, and the public. The comments that follow do not constitute a waiver of any factual or legal issue raised by any of these organizations or individuals and not specifically discussed herein.

seismic surveys you propose would be the first ever conducted in these remote waters. PEA at 24.

Because the surveys have significant potential to harm marine life, including fish and endangered whales, federal law is clear that they must be analyzed in a full Environmental Impact Statement ("EIS"). Moreover, given your assessment that this will be just the first of many consecutive summers of intensive seismic surveying in these same waters (PEA at Table III.C-1), it is improper for you to segment your analysis of these surveys year-by-year. Doing less than a Programmatic EIS that accounts for foreseeable future seismic surveys in the Beaufort and Chukchi seas risks severely underestimating impacts to marine life and Alaska Native communities and failing to provide mitigation or undertake alternatives necessary to reduce those impacts.

I. BACKGROUND

A. Impacts of seismic survey noise to marine life

The oil and gas industry typically relies for offshore exploration on airguns, submersible devices that are towed behind boats singly or in long arrays, firing shots of compressed air into the water about every ten seconds.² A large seismic array can produce effective peak pressures of sound that are higher than those of virtually any other man-made source save explosives – over 250 decibels.³ If the seafloor is hard and acoustically reflective, the noise might be heard for many hundreds of miles; under the right conditions, it can reverberate in such a way as to sound nearly continuous, masking the calls of baleen whales and other animals that rely on the acoustic environment for breeding and survival.⁴

A substantial body of evidence demonstrates that airgun pulses and other forms of intense ocean noise can have a wide range of impacts on marine animals, including marine mammals, fish, and invertebrates such as squid.

1. Impacts to marine mammals

Marine mammals are believed to depend on sound to navigate, find food, locate mates, avoid predators, and communicate with each other. Flooding their habitat with man-

² The airgun, which replaced dynamite as the industry's primary method of underwater exploration, is not the only technology used today. Other methods, which also produce impulsive noise above 200 decibels (dB), include sleeve exploders, gas guns, sparkers, and boomers. In addition, survey vessels frequently employ multi-beam and sub-bottom profiling sonars whose source levels run as high as 230 dB (RMS) or more. W.J. Richardson, C.R. Greene, Jr., C.I. Malme, and D.H. Thomson, *Marine Mammals and Noise* 136-47 (1995).

³ Except where noted, all decibel levels cited herein represent the peak pressure of the sound source, calculated in reference to one microPascal-meter (re 1 μ Pa-m), at one meter's distance.

⁴ See, e.g., International Whaling Commission, 2004 Report of the Scientific Committee: Annex K (2004).

made, high-intensity noise interferes with these and other functions. As marine science and the courts have increasingly recognized, intense underwater sound can have a range of deleterious effects on marine mammals and other ocean life. *See, e.g., National Parks & Conservation Ass'n v. Babbitt*, 241 F.3d 722 (9th Cir. 2001); *NRDC v. Evans*, 279 F.Supp.2d 1129 (N.D. Cal. 2003); International Whaling Commission, Report of the Scientific Committee to the International Whaling Commission, at § 12.2.5 and Annex K (2004) (concluding that there is “now compelling evidence implicating anthropogenic sound as a potential threat to marine mammals” at both the “regional and ocean scale levels.”)

The harmful effects of high-intensity human-made noise include:

- strandings and other non-auditory physical injuries;
- temporary or permanent loss of hearing, which impairs an animal’s ability to communicate, avoid predators, and detect and capture prey;
- avoidance behavior, which can lead to abandonment of habitat or migratory pathways;
- disruption of biologically important behaviors such as mating, feeding, nursing, or migration, or loss of efficiency in conducting those behaviors;
- aggressive (or agonistic) behavior, which can result in injury;
- masking of biologically meaningful sounds, such as the call of predators or potential mates;
- chronic stress, which can compromise viability, suppress the immune system, and lower the rate of reproduction;
- habituation, causing animals to remain near damaging levels of sound, or sensitization, exacerbating other behavioral effects; and
- declines in the availability and viability of prey species, such as fish and shrimp.⁵

⁵ For a review of research on behavioral and auditory impacts of undersea noise, see, *e.g.*, W. John Richardson *et al.*, *Marine Mammals and Noise* (1995); Jonathan Gordon & Anna Moscrop, “Underwater Noise Pollution and Its Significance for Whales and Dolphins,” in *The Conservation of Whales and Dolphins* (M.P. Simmons & J.D. Hutchinson eds., 1996); National Research Council, “Ocean Noise and Marine Mammals” (2003); P. Tyack, “Behavioral Impacts of Sound on Marine Mammals,” Presentation to the U.S. Marine Mammal Commission Advisory Committee on Acoustic Impacts on Marine Mammals (February 4, 2004); Whale and Dolphin Conservation Society, “Oceans of Noise” (2004). For two papers on strandings of whales associated specifically with seismic exploration, see M.H. Engel, M.C.C. Marcondes, C.C.A. Martins, F. O Luna, R.P. Lima, and A. Campos, “Are Seismic Surveys Responsible for Cetacean Strandings? An Unusual Mortality of Adult Humpback Whales in Abrolhos Bank, Northeastern Coast of Brazil,” IWC Doc. SC/56/E28 (2004); J. Hildebrand, “Impacts of Anthropogenic Sound on Cetaceans,” IWC Doc. SC/56/E13 (2004) (includes discussion of a stranding of Cuvier’s beaked whales in the Gulf of California in September 2002).

Seismic surveys, in particular, can seriously harm whales and other marine mammals. Impacts range from tissue hemorrhaging and strandings, to temporary and permanent hearing loss, to abandonment of habitat and disruption of vital behaviors like mating and feeding.

In 2002, for example, two beaked whales (*Ziphius cavirostris*) were found to have stranded in the Gulf of California, Mexico, coincident with geophysical surveys that were being conducted in the area.⁶ That same year, endangered adult humpback whales were reported to have stranded in unusually high numbers along Brazil's Abrolhos Banks, where oil-and-gas surveys were being conducted.⁷ Studies suggest that critically endangered western Pacific gray whales were displaced from important feeding grounds and exhibited behavioral changes in response to seismic surveys off Russia's Sakhalin Island.⁸ Other marine mammal species known to be affected by airgun arrays include sperm whales, whose distribution in the northern Gulf of Mexico has been observed to change in response to seismic operations; bowhead whales, which have been seen to avoid survey vessels to a distance of more than thirty-five miles while migrating off the Alaskan coast; and harbor porpoises, which have been seen to engage in dramatic avoidance responses.⁹

Based on this and other evidence, a consensus has emerged in the international scientific community that ocean noise, including noise from seismic surveys, presents a problem of significant and growing concern for marine mammals and other marine life. In 2004, for example, a working group of the International Whaling Commission ("IWC")'s Scientific Committee, representing over 100 of the world's leading marine biologists, reached a "unanimous" conclusion about the state of the science: that there "was now compelling

⁶ Hildebrand, J., "Impacts of anthropogenic sound on cetaceans," Paper submitted to the IWC Scientific Committee (2004) (SC/56/E13).

⁷ Engel, M.H., M.C.C. Marcondes, C.C.A. Martins, F. O Luna, R.P. Lima, and A. Campos, "Are seismic surveys responsible for cetacean strandings? An unusual mortality of adult humpback whales in Abrolhos Bank, Northeastern coast of Brazil," Paper submitted to the IWC Scientific Committee (2004) (SC/56/E28).

⁸ See Würsig, B., D.W. Weller, A.M. Burdin, S.A. Blokhin, S.H. Reeve, A.L. Bradford, R.L. Brownell, Jr., "Gray whales summering off Sakhalin Island, Far East Russia: July-October 1997, A joint U.S.-Russian scientific investigation," Final contact report to Sakhalin Energy Investment Company (1999); Weller, D.W., A.M. Burdin, B. Würsig, B.L. Taylor, and R.L. Brownell, Jr., "The western Pacific gray whale: A review of past exploitation, current status and potential threats," *J. Cetacean Res. Manage.* 4 (2002): pp. 7-12.

⁹ See, e.g., Mate, B.R., K.M. Stafford, and D.K. Ljungblad, "A change in sperm whale (*Physeter macrocephalus*) distribution correlated to seismic surveys in the Gulf of Mexico," *J. Acoustical Soc. Am.* 96 (1994): pp. 3268-69 (sperm whales); PEA at 127 and MMS's Beaufort Sea Lease Sale 195 (and 186), stipulation No. 4 (acknowledging that "experiences relayed by subsistence hunters indicate that, depending on the type of operations, some whales demonstrate avoidance behavior at distances of up to 35 miles") (bowhead whales); Malme et al., "Investigations of the potential effects of underwater noise from petroleum industry activities on migrating gray whale behavior," (1983) (BBN Rep 5366) (gray whales); pers. comm. with Dr. David Bain, U. Washington (Nov. 10, 2003) (harbor porpoises).

evidence implicating anthropogenic sound as a potential threat to marine mammals, [a threat that is] manifested at both regional and ocean-scale levels that could impact populations of animals.”¹⁰ The Scientific Committee went on to identify increases in seismic noise as “cause for serious concern” and to recommend scheduling seismic surveys to be out-of-phase with large whales, or, if conducted in critical whale habitat, to employ “strict monitoring and mitigation.”¹¹ As one sign of its continued concern about impacts to whales from seismic survey noise, this year the Scientific Committee is dedicating a symposium to the topic, with one focus of the meeting on mitigation measures to lessen these impacts.

2. Impacts to fish

Though the architecture of their ears may differ, fish are equipped, like all vertebrates, with thousands of sensory hair cells that vibrate with sound; and a number of specialized organs, like the abdominal sac, called a “swim bladder,” that some species possess can boost hearing and a “lateral line” of sensory and hair cells that run the length of their bodies. Fish use sound in many of the ways that marine mammals do: to communicate, defend territory, avoid predators, and, in some cases, locate prey.¹²

One series of recent studies showed that fish sustained extensive damage to the hair cells located at the sensory epithelia of the inner ear after they were exposed to impulsive air gun noise.¹³ The damage, described as “blebbing” and “blistering” on the surface of the epithelia, “suggest that hair cells had been ‘ripped’ from the epithelia (immediate mechanical damage) or, alternatively, had ‘exploded’ after exposure (physiological damage).”¹⁴ In the context of the draft PEA, this study is particularly significant because the inner ear of species examined (pink snapper) “is typical” of a number of important fish species found in the Beaufort and Chukchi seas, including salmon, cod, and haddock.¹⁵ Fish, unlike mammals, are thought to regenerate hair cells, but the pink snapper in those studies did not appear to recover within approximately two months after exposure, leading researchers to conclude that the damage was permanent.¹⁶ As researchers have consistently acknowledged, even a short-term loss in hearing can (let alone the virtually permanent damage seen in snapper) will substantially diminish its

¹⁰ International Whaling Commission, 2004 Report of the Scientific Committee at Annex K, § 6.4.

¹¹ *Id.* at §§ 12.2.5.1, 12.2.5.2.

¹² See, e.g., A.N. Popper, Effects of Anthropogenic Sounds on Fishes, 28(10) *Fisheries* 26-27 (2003); M.C. Hastings & A.N. Popper, Effects of Sound on Fish 19 (2005) (Report to the California Department of Transportation, Contract No. 43A0139); D.A. Croll, Marine Vertebrates and Low Frequency Sound—Technical Report for LFA EIS 1-90 (1999).

¹³ McCauley et al., High Intensity Anthropogenic Sound Damages Fish Ears, *J. Acoust. Soc. Am.* 113 (Jan. 2003).

¹⁴ *Id.* at 640.

¹⁵ *Id.* at 641

chance of survival: “[f]ishes with impaired hearing would have reduced fitness, potentially leaving them vulnerable to predators, possibly unable to locate prey, sense their acoustic environment, or, in the case of vocal fishes, unable to communicate acoustically.”¹⁷

As with marine mammals, sound has also been shown to induce temporary hearing loss in fish. Even at fairly moderate levels, for example, noise from outboard motor engines is capable of temporarily deafening some species of fish, and other sounds have been shown to affect the short-term hearing of a number of other species, including sunfish and tilapia.¹⁸

Nor is hearing loss the only effect that ocean noise can have on fish. Numerous studies, for example, have noted that fish display marked “alarm” responses to airguns and other forms of anthropogenic noise.¹⁹ And for years fishermen in various parts of the world have complained about declines in their catch after intense acoustic activities moved into the area, suggesting that noise is seriously altering the behavior of some commercial species.²⁰ A group of Norwegian scientists attempted to document these declines in a Barents Sea fishery and found that catch rates of haddock and cod (the latter known for its particular sensitivity to low-frequency sound) plummeted in the vicinity of an airgun survey across a 1600-square-mile area, an area larger than the state of Rhode Island. In another experiment, catch rates of rockfish were similarly shown to decline.²¹ Drops in catch rates in these experiments range from 40 to 80 percent.²²

¹⁶ Id. (some fish in the experimental group sacrificed and examined 58 days after exposure).

¹⁷ See McCauley et al., High Intensity Anthropogenic Sound Damages Fish Ears, at 641; Popper, Effects of Anthropogenic Sounds at 29.

¹⁸ A.R. Scholik and H.Y. Yan, Effects of Boat Engine Noise on the Auditory Sensitivity of the Fathead Minnow, *Pimephales promelas*, 63 Environmental Biology of Fishes 203-09 (2002); A.R. Scholik and H.Y. Yan, The Effects of Noise on the Auditory Sensitivity of the Bluegill Sunfish, *Lepomis macrochirus*, 133 Comparative Biochemistry and Physiology Part A at 43-52 (2002); M.E. Smith, A.S. Kane, & A.N. Popper, Noise-Induced Stress Response and Hearing Loss in Goldfish (*Carassius auratus*), 207 Journal of Experimental Biology 427-35 (2003); Popper, Effects of Anthropogenic Sounds at 28.

¹⁹ See F.R. Knudsen, et al., Awareness reactions and avoidance responses to sound in juvenile Atlantic salmon, *salmo salar L.*, Journal of Fish Biology (1992) 40, 523-534; Robert D. McCauley, et al. Marine Mammal Seismic Surveys: Analysis and Propagation of Air-Gun Signals; and Effects of Air-Gun Exposure on Humpback Whales, Sea Turtles, Fishes and Squid, Curtin University, Centre for Marine Science and Technology (August 1999); C.S. Wardle, et al., Effects of seismic air guns on marine fish, Continental Shelf Research 21, 1005-1027 (2001).

²⁰ See “‘Noisy’ Royal Navy Sonar Blamed for Falling Catches,” Western Morning News, Apr. 22, 2002 (sonar off the U.K.); Percy J. Hayne, President of Gulf Nova Scotia Fleet Planning Board, “Coexistence of the Fishery & Petroleum Industries,” www.elements.nb.ca/theme/fuels/percy/hayne.htm (accessed May 15, 2005) (airguns off Cape Breton); R.D. McCauley, J. Fewtrell, A.J. Duncan, C. Jenner, M.-N. Jenner, J.D. Penrose, R.I.T. Prince, A. Adhitya, J. Murdoch, and K. McCabe, Marine Seismic Surveys: Analysis and Propagation of Air-Gun Signals, and Effects of Air-Gun Exposure on Humpback Whales, Sea Turtles, Fishes, and Squid 185 (2000) (airguns in general).

²¹ See A. Engås, S. Løkkeborg, E. Ona, and A.V. Soldal, Effects of Seismic Shooting on Local Abundance and Catch Rates of Cod (*Gadus morhua*) and Haddock (*Melanogrammus aeglefinus*), 53 Canadian Journal of Fisheries and Aquatic Sciences 2238-49 (1996); J.R. Skalski, W.H. Pearson, and C.I. Malme, Effects of

As the PEA acknowledges, the potential for airguns to cause significant behavioral changes in fish and fish stocks is particularly acute when multiple sources are proposed. In such cases “the interaction of two or more surveys may facilitate the stranding of some schooling or aggregated arctic fishes onto coastal or insular beaches.” PEA at 61.

Equally troubling are the high mortalities from noise exposure seen in developmental stages of fish. A number of studies, including one on non-impulsive noise, show that intense sound can kill eggs, larvae, and fry outright or retard their growth in ways that may hinder their survival later.²³ Increased mortality for fish eggs has been shown to occur at distances of 5 meters from an airgun source; mortality rates approaching 50 percent affected yolk sac larvae at distances of 2 to 3 meters.²⁴ Also, larvae in at least some species are known to use sound in selecting and orienting toward settlement sites.²⁵ Acoustic disruption at that stage of development could have significant consequences on effected species.²⁶

3. Impacts to other species

Many species in addition to mammals and fish are potentially impacted by the use of air gun arrays in seismic survey operations. It has recently been observed that many species of invertebrates possess mechanosensors that bear resemblance to vertebrate ears, making it “important to examine the effect of anthropogenic sounds on a wider range of marine fauna.”²⁷

Indeed, scientists have recorded two strandings of multiple giant squid on the Spanish coast, in both cases coinciding with nearby seismic airgun operations. During the first event, five giant squid washed up dead on Spanish beaches shortly after two seismic

Sound from a Geophysical Survey Device on Catch-Per-Unit-Effort in a Hook-and-Line Fishery for Rockfish (*Sebastes* spp.), 49 Canadian Journal of Fisheries and Aquatic Sciences 1357-65 (1992). See also S. Løkkeborg and A.V. Soldal, The Influence of Seismic Exploration with Airguns on Cod (*Gadus morhua*) Behaviour and Catch Rates, 196 ICES Marine Science Symposium 62-67 (1993).

²² Id.

²³ See, e.g., C. Booman, J. Dalen, H. Leivestad, A. Levsen, T. van der Meeren, and K. Toklum, Effekter av luftkanonskyting på egg, larver og yngel (Effects from Airgun Shooting on Eggs, Larvae, and Fry), 3 Fiskeri og Havet 1-83 (1996) (Norwegian with English summary); J. Dalen and G.M. Knutsen, Scaring Effects on Fish and Harmful Effects on Eggs, Larvae and Fry by Offshore Seismic Explorations, in H.M. Merklinger, Progress in Underwater Acoustics 93-102 (1987); A. Banner and M. Hyatt, Effects of Noise on Eggs and Larvae of Two Estuarine Fishes, 1 Transactions of the American Fisheries Society 134-36 (1973); L.P. Kostyuchenko, Effect of Elastic Waves Generated in Marine Seismic Prospecting on Fish Eggs on the Black Sea, 9 Hydrobiology Journal 45-48 (1973).

²⁴ Booman et al., Effekter av luftkanonskyting på egg, larver og yngel at 1-83.

²⁵ S.D. Simpson, M. Meekan, J. Montgomery, R. McCauley, R., and A. Jeffs, Homeward Sound, 308 Science 221 (2005).

²⁶ Popper, Effects of Anthropogenic Sounds at 27.

²⁷ Popper, Effects of Anthropogenic Sounds at 30.

survey vessels conducted operations in the area. Two years later, four additional strandings were recorded under similar circumstances. The dead squid all were found with lesions on their skin and damaged internal organs.²⁸ Other species of squid have been shown to exhibit a strong startle response to air guns signals and, based on that response, it is thought that seismic surveys may significantly alter squid behavior up to 2-5 kilometers away.²⁹ Captive brown shrimp raised in a noisy environment showed reduced growth and reproduction rates as well as an increased rate of aggression (cannibalism).³⁰ And some preliminary research from Canada suggests that snow crabs exposed to seismic surveys may show increased incidence of liver and ovary damage.³¹

B. The Proposed Seismic Surveys

MMS proposes allowing up to four seismic surveys in the Beaufort Sea and the same number for the Chukchi Sea. PEA at Table I.C-1. The duration and intensity of even a single seismic survey is considerable: One survey can last for “days, weeks or months,” during which time seismic airguns are firing “every 10-15 seconds.” PEA at 6. For a 3D survey, a single seismic vessel will typically tow up to 27 airguns and will blanket the marine area being surveyed in racetrack-shaped circuits. Id. MMS would allow these surveys to be conducted for almost a full six months, from June through early November. PEA at Table I.C-1.

The underwater noise produced by seismic airgun arrays is among the most intense generated by man, exceeded only by noise from explosives. Source noise levels reach to 235-259 dB (PEA at Table III.B-1), which is over *a billion* times more intense than the level (120 dB) that has been shown to result in “almost total bowhead whale exclusion.” PEA at 24.

If allowed, these surveys would be the first in the Chukchi Sea in fifteen years, and the first 3D surveys ever conducted there. For bowheads, the Chukchi Sea is where “[m]ost calving probably occurs.” PEA at 88.

²⁸ See Angel Guerra, Institute for Marine Investigations, Vigo, Spain, Presentation to the Annual Science Conference of the International Council for the Exploration of the Sea (2004); Debora MacKenzie, “Seismic Surveys May Kill Giant Squid,” *New Scientist* (September, 2004) (available at <http://www.newscientist.com/article.ns?id=dn6437>).

²⁹ Robert D. McCauley, *et al.*, Marine Mammal Seismic Surveys: Analysis and Propagation of Air-Gun Signals; and Effects of Air-Gun Exposure on Humpback Whales, Sea Turtles, Fishes and Squid, Curtin University, Centre for Marine Science and Technology (August 2000).

³⁰ J.P. Lagardère, “Effect of Noise on Growth and Reproduction of *Cragon cragon* in Rearing Tanks,” *Marine Biology* 71 177-185 (1982).

³¹ Department of Fisheries and Oceans, Canadian Science Advisory Secretariat, Potential Impacts of Seismic Energy on Snow Crab, (September 2004).

II. MMS'S COMPLIANCE WITH THE NATIONAL ENVIRONMENTAL POLICY ACT

Enacted by Congress in 1969, NEPA establishes a national policy to “encourage productive and enjoyable harmony between man and his environment” and “promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man.” 42 U.S.C. § 4321. In order to achieve its broad goals, NEPA mandates that “to the fullest extent possible” the “policies, regulations, and public laws of the United States shall be interpreted and administered in accordance with [NEPA].” 42 U.S.C. § 4332. As the Supreme Court explained,

NEPA’s instruction that all federal agencies comply with the impact statement requirement – and with all the requirements of § 102 – “to the fullest extent possible” [cit. omit.] is neither accidental nor hyperbolic. Rather the phrase is a deliberate command that the duty NEPA imposes upon the agencies to consider environmental factors not be shunted aside in the bureaucratic shuffle.

Flint Ridge Development Co. v. Scenic Rivers Ass’n, 426 U.S. 776, 787 (1976).

Central to NEPA is its requirement that, before any federal action that “may significantly degrade some human environmental factor” can be undertaken, agencies must prepare an environmental impact statement, or EIS. Steamboaters v. F.E.R.C., 759 F.2d 1382, 1392 (9th Cir. 1985) (emphasis in original). The fundamental purpose of an EIS is to force the decision-maker to take a “hard look” at a particular action – at the agency’s need for it, at the environmental consequences it will have, and at more environmentally benign alternatives that may substitute for it – before the decision to proceed is made. 40 C.F.R. §§ 1500.1(b), 1502.1; Baltimore Gas & Electric v. NRDC, 462 U.S. 87, 97 (1983).

Here, we applaud MMS’s decision to analyze the proposed surveys programmatically, as the law requires. Yet the agency’s analysis has some significant shortcomings, the most important of which is its decision not to conduct an EIS for the proposed surveys, despite clear evidence that they may significantly affect the marine environment. Other shortcomings include a failure to consider the full range of reasonable alternatives; the proposal of insufficient mitigation measures; the adoption of noise-level thresholds for behavioral acoustic impacts that are too lax and unsupported by sound science; and a segmentation of impacts that may mask the true environmental cost of these surveys. Each of these issues and others is discussed below.

A. The Proposed Action Significantly Affects the Quality of the Human Environment, and an EIS is Therefore Required

1. CEQ’s significance criteria are met

As discussed, NEPA requires federal agencies to prepare an EIS for any major federal action “significantly affecting the quality of the human environment.” 42 U.S.C. §

4332(2)(C). Significant effects need not be certain to occur to trigger the EIS requirement – rather, “an EIS *must* be prepared if ‘substantial questions are raised as to whether a project . . . *may* cause significant degradation of some human environmental factor.’” Idaho Sporting Congress v. Thomas, 137 F.3d 1146, 1149 (9th Cir. 1998) (quoting Greenpeace Action v. Franklin, 14 F.3d 1324, 1332 (9th Cir. 1992)).

The Council on Environmental Quality (“CEQ”) has enacted regulations to ensure compliance with NEPA. These regulations “are binding on all federal agencies and provide guidance to the courts for interpreting NEPA requirements.” Or. Natural Res. Council v. United States Forest Serv., 834 F.2d 842, 847 n. 5 (9th Cir. 1987). In determining whether a proposed action “significantly” affects the environment and thus requires an EIS, CEQ regulations lay out ten factors for federal agencies to consider. 40 C.F.R. § 1508.27(b). Any one of these factors, standing alone, is sufficient to require preparation of an EIS. Ocean Advocates v. United States Army Corps of Eng’rs, 402 F.3d 846, 865 (9th Cir. 2005). In this case, at least the following six factors strongly suggest that preparation of an EIS is required:

- (1) Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas;
- (2) The degree to which the effects on the quality of the human environment are likely to be highly controversial;
- (3) The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks;
- (4) The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration;
- (5) Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts; and
- (6) The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.

40 C.F.R. § 1508.27(b)(3)-(7), (9).

a. Unique characteristics

The geographic area is unique. The Beaufort and Chukchi seas are among the most remote and pristine marine areas in the United States, and they support a wide variety of fish, marine birds, and marine mammals that have adapted to surviving in extremely harsh conditions. Sea ice is another unique feature of these seas and it has a critical influence in the distribution and behavior of marine mammals and other life, such as seasonal concentrations or migratory routes; may necessitate ice breaking activities to support seismic and drilling operations and for other access such as fueling support; and poses a unique difficulty in response to and clean up of oil and fuel spills. Further, unlike in any other coastal area in the United States, there are several communities whose residents depend on the ocean resources for subsistence and whose culture is inextricably linked to them. "The Inupiat people's entire history, culture, and identity have revolved around their subsistence-harvest activities lifestyle, and only within the last 60 years have semi-nomadic Inupiat settled into sedentary villages and been subjected to managed hunts." PEA at 28. The potential threats to the unique characteristics of this Arctic ecosystem must be considered in an EIS.

b. Controversy

The proposal to conduct seismic survey activities in the Beaufort and Chukchi seas is highly controversial. These seas are home to a variety of marine mammals and fish, including rare, threatened, and endangered species. Numerous individuals, organizations, and subsistence communities whose culture and livelihoods depend on the marine mammals and fish have vociferously opposed MMS's proposals to conduct seismic activities in the Beaufort and Chukchi seas, including the currently proposed activities. The substantial number of letters MMS has received regarding this opposition attests to the fact that MMS's proposal is highly controversial. In addition, representatives of the organizations on this letter attended meetings throughout Alaska and witnessed first-hand strong statements in opposition to the proposed activities, contesting MMS's conclusions about the severity of the effects of seismic activities. This high degree of controversy warrants the preparation of an EIS. There has been significant and sustained controversy over the Outer Continental Shelf offshore oil and gas leasing program in the Chukchi and Beaufort Seas, including a number of legal challenges regarding lack of adequate protection to bowhead whales.³²

The PEA does not discuss in any detail this controversy or why MMS deems it insignificant. MMS states only that "[t]here is lack of agreement and controversy within the scientific and stakeholder communities about the potential effects of noise on baleen whales, including bowhead whales." PEA at 137. This passing comment ignores the degree and significance of the controversial issues surrounding the proposed seismic activities.

³² P.A. Miller, D. Smith, and P.K. Miller, "Oil in Arctic Waters: the Untold Story of Offshore Drilling in Alaska," 1993, at 7.

c. Uncertainty

The proposal also involves highly uncertain effects and unknown risks, particularly in the Chukchi Sea where there have been no seismic activities since 1990, and where no 3D seismic activity has ever been conducted. PEA at 3, 24. The PEA repeatedly recognizes this uncertainty. See, e.g., PEA at 49 (due to a lack of surveying for 15-17 years, “[i]nformation of current distribution and abundance (e.g., density/km²) estimates, age structure, population trends, or habitat use areas are not available or are outdated for fish populations in the northeastern Chukchi or western Beaufort seas”); id. at 80 (“It would be difficult to quantify effects in terms of the number of marine birds potentially affected or areas of habitat potentially modified or lost, because the area of the proposed seismic surveys is very large and specific knowledge of marine bird distribution and density within the survey area is limited”); id. at 83 (no data to confirm whether fin and humpback whales do not enter “the Chukchi OCS Planning Area, or adjacent areas to the south”); id. at 92 (there have been no surveys of bowhead whales in the Chukchi Sea for more than 15 years, the Arctic has experienced “significant reductions” in sea ice thickness and extent and, as a result, “we acknowledge considerable uncertainty about the extent of current use of the Chukchi Sea by bowhead whales, especially during the summer months and the fall migration”); id. at 109 (“we are uncertain as to exactly where or how much seismic survey activity will occur”); id. at 110 (“the effects of anthropogenic noise on baleen (or other cetacean) calves, especially newborn calves, is uncertain”); id. at 111 (the “bowhead’s association with ice and its dependence on the spring lead and polynya system make it problematic to extrapolate about the potential impacts of seismic noise, or other loud noise, that could affect whales within these systems based on information available about other species that have been exposed to such potential affectors in open water, or even from information about bowheads that have been exposed to seismic-survey noise in open water”); id. at 133 (“While it is clear that seismic activity may overlap with bowhead use of the Chukchi Sea during fall migration, we are highly uncertain about the likely extent of overlap between seismic activity and bowhead whales in the summer.”)

Given these vast areas of acknowledged uncertainty, many of which relate to critical issue of impacts to the endangered bowhead whale, MMS simply cannot conclude on this record that the proposed surveys will have no significant impact on the environment. A full EIS will allow MMS to dedicate the time and resources to the analysis of impacts that the potential risks of these surveys warrant.

d. Precedent

MMS intends to hold three lease sales in the Beaufort Sea and three in the Chukchi Sea between 2007 and 2012.³³ Perhaps related to these sales, MMS projects that this summer of surveying will mark the beginning of a period of intensive survey effort, with at least

³³ See MMS, “Draft Proposed Program, Outer Continental Shelf Oil and Gas Leasing Program, 2007-2012” at 5 (Feb. 2006); Multi-Sale FEIS at I-2.

four additional years of similar seismic activity to come, all occurring in the Beaufort and Chukchi seas. PEA at Table III.C-1. Allowing the NEPA analysis of this year's seismic surveys to go forward as a PEA would therefore set an unfortunate precedent for the treatment of future surveys and other oil and gas activities, which together will likely have very significant cumulative effects on the endangered bowhead whale, on other marine species, on Native communities, and on the Arctic ecosystem. In allowing the currently proposed activities to proceed based only on the preparation of an environmental assessment, MMS makes a "decision in principle about . . . future consideration[s]" and risks serially underestimating the impacts of these surveys. 40 C.F.R. § 1508.27(b). MMS must therefore prepare a full EIS.

e. Cumulatively significant impacts

Dr. Sylvia Earle, the former Chief Scientist at NOAA, has called the problem of undersea noise pollution "like the death of a thousand cuts" – "[e]ach sound in itself may not be a matter of critical concern, but taken all together, the noise from shipping, seismic surveys, and military activity is creating a totally different environment than existed even fifty years ago."³⁴ Many different sources of human-made noise combine to create a din in the ocean whose significance far exceeds that of any individual contributing action.

The CEQ regulations recognize the problem of cumulative effects and provide a solution. "Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment." 40 C.F.R. § 1508.27(b)(7). Even if one were to conclude that the seismic surveys proposed here would not, in themselves, have a significant effect on the environment—a conclusion that we vigorously contest for all of the reasons outlined in this letter—one would therefore still be required to prepare an EIS for these surveys because of their contribution to the pressing and growing problem of intense undersea noise.

The cumulative effect of the proposed surveys plus noise from the additional seismic surveys projected to occur; 'routine' hazard surveys employing seismic airguns; vessel and shipping noise; oil-and-gas construction, support, drilling, and production operations noise; offshore causeways and docks; and other industrial marine activities may disrupt bowhead migrations, disturb and injure fish, and exclude species from important habitat. MMS should not be permitted to segment its analysis of each of these contributors to the problem of ocean noise, especially given scientific consensus that this problem is "a potential threat to marine mammals" that is "manifested at both regional and ocean-scale levels that could impact populations of animals."³⁵ Furthermore, bowhead and beluga populations migrate to critical habitats in Canada where there may also be significant oil and gas activities and other impacts; furthermore, operations such as movement of a

³⁴ Quoted in "Sounding the Depths II: The Rising Toll of Sonar, Shipping and Industrial Ocean Noise on Marine Life," at iv (NRDC 2005).

³⁵ International Whaling Commission, 2004 Report of the Scientific Committee at Annex K, § 6.4.

drilling vessel currently being stored in Canada will involve trans-boundary oil and gas impacts to the migratory animals.

Cumulative impacts to the subsistence harvests of Inupiat residents of the North Slope involve a combination of adverse impacts to subsistence resources and to residents' ability to access these resources. The proposed surveys would combine with onshore oil and gas activities on the North Slope, marine transport and activities associated with the Red Dog mine, and other activities along the Chukchi Sea coast to worsen these impacts.

f. Endangered species

Both the Chukchi and the Beaufort Sea are key habitat for endangered bowhead whales. PEA at 87-99 (explaining, *inter alia*, that “[m]ost calving probably occurs in the Chukchi Sea” (at p.88) and that “bowhead whales feed in both the Chukchi and Beaufort Sea Planning Areas” (at p.92)). As the PEA acknowledges, impacts to these whales could therefore be severe. See, e.g., PEA at 133 (“seismic survey activities could potentially exclude, through avoidance, bowhead whales from areas for the entire Beaufort Sea open-water autumn migration/autumn feeding period”) and 143 (all alternatives “are likely to adversely affect bowhead whales and other marine mammals, principally through incidental harassment due to exposure to seismic survey noise”). Other endangered species that may be affected by the surveys include humpback whales, fin whales, and several species of marine birds. The recognized potential for impacts to these species is, alone, sufficient to trigger the requirement to prepare an EIS.

2. MMS Cannot Rely on Mitigation Measures to Avoid the Preparation of an EIS.

MMS recognizes that there may be adverse effects from the proposed seismic activities, including effects significant enough to harass large numbers of endangered bowhead whales and require the issuance of an incidental harassment authorization under the MMPA. See, e.g., PEA at 133 (“seismic survey activities could potentially exclude, through avoidance, bowhead whales from areas for the entire Beaufort Sea open-water autumn migration/autumn feeding period”) and 143 (all alternatives “are likely to adversely affect bowhead whales and other marine mammals, principally through incidental harassment due to exposure to seismic survey noise”). It appears, however, that MMS attempts to avoid preparing an EIS based on a belief that mitigation will render any potential effects insignificant. Id. at 133-134. This approach is problematic for several reasons.

“As a general rule, . . . agencies should use a broad approach in defining significance and should not rely on the possibility of mitigation as an excuse to avoid the EIS requirement.” Forty Most Asked Questions Concerning CEQ’s National Environmental Policy Act Regulations, 46 C.F.R. 18,026, 18038 (March 23, 1981). If an agency relies on mitigation measures, such measures must “constitute an adequate buffer against the negative impacts that may result from the authorized activity.” Nat’l Parks &

Conservation Ass'n v. Babbitt, 241 F.3d 722, 734 (9th Cir. 2001). Specifically, the measures must “render such impacts so minor as to not warrant an EIS.” Id. Further, the agency may not speculate that its mitigation measures will suffice to prevent environmental harms. Found. for N. Am. Wild Sheep, 681 F.2d 1172, 1179 (9th Cir. 1982). The measures must be supported by analytical data. Idaho Sporting Congress v. Thomas, 137 F.3d 1146, 1151 (9th Cir. 1998).

Here, as discussed at length below, MMS’s proposed mitigation measures do not meet these stringent requirements. The measures are insufficient to prevent significant harm to whales, other marine mammals, or fish, and MMS does not and cannot point to data showing otherwise. See infra at I.L.C. MMS’s proposed mitigation measures do not preclude the need for an EIS.

3. The significance threshold applied by MMS is unlawful

In light of the factors discussed above, the PEA’s significance criteria are neither biologically nor legally justifiable.

To begin with, the PEA includes an extraordinarily high threshold for finding a “significant impact” to a “biological resource” (which the PEA defines to include all marine mammals not listed under the federal Endangered Species Act, all non-listed species of marine birds, all species of fish, and all invertebrates and other “lower trophic-level organisms”). Under this criterion, significance is defined as:

An adverse impact that results in an abundance decline and/or change in distribution requiring three or more generations (or having an impact lasting 10 or more years) for the indicated population to recover to its former status, and one or more generations for “rare” fish resources (see section III.F.1 – Fish/Fishery Resources and EFH for a discussion about “rare” fish resources) and their EFH, and polar bears.

PEA at 35. It simply is not scientifically supportable to conclude that a decline in the abundance or distribution of a marine mammal or fish stock that takes a decade (or three generations) to recover from is not biologically “significant.”

For example, and as discussed above, the PEA acknowledges that Arctic cod is one of “the most acoustically sensitive species occurring in the planning areas” and may be the “key species in the ecosystem of the Arctic ocean.” PEA at 57, App. B p. 14. The PEA also notes the potential of seismic surveys to induce significant physiological damage and behavioral disruption in cod stocks. Id. at 56. Yet, by its terms, the PEA would consider a distribution shift or decline in abundance of this species lasting a decade as not significant. As discussed in more detail above, this criterion also does not take sufficiently into account the cumulative impacts of repeated seismic surveys in the area over a period of years.

Nor does the PEA's special provisions for "rare" fish resources and polar bears add much meaningful protection for many of these species. For both categories, a significant impact is defined as any impact that takes more than a single generation (or, presumably, a decade) to recover from. However, since many of the species subject to this provision are long-lived and take several years to reach sexual maturity—polar bears, for example, can take four years to reach sexual maturity and live more than thirty³⁶—it actually provides little added protection for the species.³⁷

The PEA's significance criterion for biological resources is also inappropriate because, as the PEA itself repeatedly acknowledges, very little is known about many of the species subject to this high threshold.³⁸ NMFS's relative lack of knowledge about the basic life history and vulnerability to ocean noise of many of the species in the planning area strongly militates in favor of lowering the significance criterion. See 40 C.F.R. § 1508.27(b)(5).

Moreover, MMS's use of this significance criteria is particularly inappropriate because its employment would allow MMS to deem "insignificant" a level of take that would, if permitted, violate other federal environmental laws—particularly the Marine Mammal Protection Act. Section 101 of the MMPA authorizes a small take permit only on the condition that, inter alia, it (i) allows the taking of only "small numbers" of marine mammals; (ii) the takings it authorizes have no more than a "negligible impact" on species and stocks; and (iii) it prescribes methods and means of effecting the "least practicable adverse impact" on species and stock and their habitat. 16 U.S.C. § 1371(a)(5)(A). In turn, the phrase "negligible impact" is defined as "an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival." 50 C.F.R. § 18.27. Any impact to marine mammals requiring ten years or three generations to correct would well exceed the definition of "negligible impact" under the MMPA. Further, such an impact would likely neither be limited to "small numbers" of animals nor represent the "least practicable adverse impact" to the species. It therefore could not be permitted under the MMPA. Similarly,

³⁶ I. Stirling, Polar Bears (University of Michigan Press 1998) at 220.

³⁷ This choice is particularly inappropriate for polar bears, which the IUCN-World Conservation Union has recently classified as "vulnerable" due to global warming. See <http://www.redlist.org/search/details.php?species=22823&tab=summ> (visited May 5, 2005). Indeed, the U.S. Fish and Wildlife Service has undertaken a formal status review to determine if polar bears should be listed as threatened or endangered under the U.S. Endangered Species Act. See "Petition to List the Polar Bear as Threatened; Notice of 90-day petition finding and initiation of status review," 71 Fed. Reg. 6745 (Feb. 9, 2006).

³⁸ To give but a few examples, the PEA states that the following information about fish and other biological resources is unknown: the timing of chum salmon outmigration in the arctic (p. 44); the factors influencing the distribution and abundance of snow crabs (p. 48); the distribution and abundance of squid in the planning area (p. 63); and the movements of pink salmon (the most abundant species of salmon in the region) while at sea (p. 43); the migratory pattern of arctic cod (App. B, p. 13); life history and distribution of the Bering flounder (App. B, p. 17)

the PEA's significance criterion for bowhead, humpback and fin whales would also violate the MMPA if applied to the proposed actions.

Finally, the PEA's significance criterion for threatened and endangered species of birds fares no better. For listed bird species, the PEA defines a significant effect as "[a]n adverse impact that results in a decline in abundance and/or change in distribution requiring one or more generation for the indicated population to recover to its former status." PEA at 35. For many of the same reasons as discussed above, this criterion is not scientifically or legally defensible. A change the distribution or population decline in a species in peril of extinction that results from a single year's activities and requires an entire generation to correct itself is, by any measure, a significant impact. And, as with the PEA's biological resources criterion, adoption of the PEA's significance criterion for listed birds would violate other federal laws. Under the federal Endangered Species Act, the issuance of federal permits approving an activity that would lead to the decline of abundance or shift in distribution of a listed species that required a generation to right itself would almost surely violate both Section 7 and 10 of the statute. See 16 U.S.C. § 1536, 1539.

B. MMS Fails to Consider the Full Range of Alternatives

At bottom, an analysis of impacts under NEPA must "inform decision-makers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment." 40 C.F.R. § 1502.1. This requirement has been described in regulation as "the heart of the environmental impact statement." Id. § 1502.14. The agency must therefore "[r]igorously explore and objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated." Id. § 1502.14(a). The alternatives proffered should "sharply defin[e] the issues and provid[e] a clear basis for choice among options by the decisionmaker and the public."³⁹ Moreover, consideration of alternatives is required by (and must conform to the independent terms of) both sections 102(2)(C) and 102(2)(E) of NEPA.

The PEA fails to meet these mandates as it examines only an extremely narrow range of alternatives. The no action alternative (Alternative 1) is immediately eliminated as "not acceptable,"⁴⁰ Alternative 2 is excluded from further evaluation, and Alternatives 3 through 6 are all based upon the same course of action—namely, private entities acting independently to collect geophysical data using seismic surveys, with no reanalysis of past seismic data and with a limited, and insufficient, range of mitigation measures considered. It is clear from the outset that MMS has pre-determined a course of action and that the only "alternatives" it considers amount to tinkering at the margins of this course of action (for example, by playing with exclusion zones for marine mammals).

³⁹ Id.

⁴⁰ PEA at 13.

Thus the public and the decisionmaker are unable to evaluate the efficacy of any markedly different alternatives or to place the proffered alternatives into a continuum of possible environmental impacts.

1. MMS fails to consider either data sharing among private entities or collection by a single operator using a standardized methodology

Although various stakeholders, including the conservation community, the whaling community, and residents of the Arctic region, have repeatedly asked MMS why numerous competing, simultaneous, and potentially redundant operations cannot be consolidated into one operation, no alternative is considered that offers this option. MMS fails to provide any analysis of why one operation would not be adequate to meet the need for this action, which is stated as follows:

MMS needs geological and geophysical seismic-survey information to fulfill its statutory responsibilities to ensure safe operations, support environmental impact analyses, protect benthic resources through avoidance measures, ensure fair market value for leases, make royalty-relief determinations, conserve oil and gas resources, and perform other statutory responsibilities.

PEA at 3. It is unclear why consolidation of uncoordinated seismic surveys through either a private or federal operator using a standardized methodology would not meet these objectives. It seems that this alternative could significantly reduce the level of seismic activity and significantly reduce the impacts to the environment, while still providing sufficient information to allow MMS to meet these goals.

2. MMS fails to adequately consider an alternative based upon reanalysis of previously collected seismic survey data

Although this PEA and other studies have confirmed that seismic surveys have a multitude of impacts upon the environment, MMS fails to consider forgoing new seismic surveys until there has been reanalysis of previously collected data. Approximately 80,000 line miles of 2D seismic surveys have been collected in the Chukchi Sea planning area and more than 100,000 line-miles of 2D and 3D seismic surveys have been collected in the Beaufort Sea Planning Area. Although MMS makes brief mention of new data-processing technology for reanalysis of existing data as a possibility under the no-action alternative (Alternative 1), there is no further discussion or analysis of this technology. MMS then arbitrarily dismisses Alternative 1 as "not acceptable" for the stated reason that under Alternative 1 there would be no geophysical data available. PEA at 13. Reanalysis of existing data clearly offers the potential of meeting the stated purpose and need for the action and would eliminate all environmental and social impacts. It is therefore a reasonable alternative that must, at least, be considered.

3. MMS fails to adequately consider alternatives to seismic surveys

Despite the high levels of potential environmental impacts and uncertainty associated with seismic surveying, MMS fails to analyze alternatives to seismic survey techniques for the collection of the data required to support potential lease sales. MMS states that

[t]he environmental assessment of alternative geophysical-survey techniques is not part of this programmatic environmental assessment (PEA).

PEA at 9. Yet the consideration of viable alternatives is precisely the purpose of NEPA environmental analyses and may not be so easily dismissed. The PEA later summarily concludes that engineering and economical considerations make alternative sources of information “not acceptable,” PEA at 13, but provides no citations or analysis for this conclusion. Given the central importance of the alternatives analysis to this undertaking, much more is required before the public and the decisionmaker can make an informed assessment that seismic surveys are worth the considerable environmental risk they pose.

4. MMS fails to consider key mitigation measures for fish and marine mammals

As discussed *infra* at Section II.C, MMS does not analyze the application of many mitigation measures for Pacific walrus and other marine mammals and fish, and the mitigation measures that are considered are far from adequate. The additional mitigation measures discussed *infra* should be incorporated into considered alternatives.

5. MMS fails to consider more restrictive geographic scope and seasonal timing restrictions

Despite the documented and highly seasonal dependence of bowhead whales and other species on the Beaufort and Chukchi seas, MMS fails to consider significantly more restrictive geographic scope and seasonal timing restrictions, including the alternatives for winter, on-ice seismic surveys.

C. The Proposed Mitigation for Marine Mammals and Fish Is Insufficient

To comply with NEPA, an agency must discuss measures designed to mitigate its project’s impact on the environment. See 42 C.F.R. § 1502.14(f). There is in fact a large and growing set of options for the mitigation of noise impacts to marine mammals and other marine life, some of which have been imposed by other jurisdictions to limit harm from seismic surveys. Yet the PEA fails to discuss a number of these options as well as other measures that might achieve the “least practicable impact,” as the Marine Mammal Protection Act requires. 16 U.S.C. § 1371(a)(5)(D)(ii)(I). Furthermore, none of these measures address the problem of long-term risk from the increasing annual surveys predicted by MMS for the Beaufort and Chukchi seas.

Additional measures that the Minerals Management Service should consider must include, inter alia:

- (a) Passive Acoustic Monitoring – Under the current plan, MMS would have operators rely primarily, and perhaps exclusively, on visual monitoring in maintaining a safety zone around the array for whales and other species. PEA at 229-231. The use of passive acoustic monitoring is merely suggested but not specifically required (PEA at 229), a tack that is likewise followed by NMFS, in its proposed incidental harassment authorization for Shell and Western Geco (71 Fed. Reg. 26055, 26068). Yet the value of passive monitoring is undisputed: NMFS’ own scientists believe that real-time monitoring, in the form of either a fixed network of hydrophones or a passive array towed by one of the support ships or the seismic vessel itself, would “add valuable information.” Id. It is also practicable: in the United Kingdom, for example, the Joint Nature Conservation Committee mandates the use of passive monitoring “where there are species of particular conservation importance or where a given species or group is difficult to detect by visual observation alone.”⁴¹ Passive acoustic monitoring should be required of all surveys conducted under this review.
- (b) Size of Safety Zone – The alternatives set forth in the PEA turn around the size of the marine mammal safety zone, which ranges from 120 dB on one end of the analysis to a decidedly less conservative 180 dB (190 dB for pinnipeds) on the other. PEA at 9-12. Remarkably, NMFS has adopted the least environmentally responsible alternative of 180/190 dB (RMS) re 1 μ Pa in the first of its proposed harassment authorizations. 71 Fed. Reg. 26055, 26066. Use of such a zone is insupportable on several grounds. First, in taking as its basis the threshold for injury or auditory threshold shift, it fails to avoid lower exposures that may result in significant behavioral effects. The threshold for such impacts has been identified both by MMS, in its present review, and by NMFS, in prior authorizations, as 160 dB re 1 μ Pa; and while the literature demonstrates impacts in some species at still lower levels (down to 140 dB re 1 μ Pa and below), industry should at least be required to maintain, as best it can, a safety zone that is consistent with the regulator’s environmental analysis. Requirements in other jurisdictions demonstrate that ship-board visual monitoring alone is practicable at least to a 3 or 4 km radius, and further distances are achievable with aerial and passive acoustic monitoring.⁴² For these reasons, the generic safety zone that

⁴¹ Joint Nature Conservation Committee, Guidelines for Minimising Acoustic Disturbance to Marine Mammals from Seismic Surveys § 4 (Apr. 2004). The JNCC has supervisory authority over seismic surveys conducted off the coast of the U.K.

⁴² Australia requires that visual monitors maintain a safety zone of 3000 km for seismic surveys and 4000 meters for mid-frequency sonar exercises; and New Zealand sets a seismic safety zone of 3000 meters for mother-calf pairs. See Environment Australia, Guidelines on the Application of the Environment Protection and Biodiversity Conservation Act to Interactions between Offshore Seismic Operations and Larger Cetaceans at Att. 6 (Oct. 2001) (Australia and New Zealand seismic requirements); Royal Australian Navy

would apply to most species of marine mammals should be no smaller than 160 dB re 1 μ Pa. Second, the chosen alternative bases its distinction between cetaceans and pinnipeds on a nine-year-old discussion that has been misunderstood by the agency and has since been superseded by science.⁴³ Studies undertaken on the acoustic sensitivity of pinnipeds do not suggest that these species are at lower risk of threshold shift or auditory injury than cetaceans.⁴⁴ Furthermore, some pinnipeds, such as harbor seals, have exhibited low discomfort thresholds, suggesting acute sensitivity to anthropogenic noise.⁴⁵ Setting a higher level for pinnipeds would be arbitrary, and its safety zone should therefore be expanded to that of cetaceans.

- (c) Bowhead Whale Safety Zone – Under the current plan, MMS would require that a safety zone for bowhead whales be maintained to the 120 dB isopleth, at least when an aggregation of whales are present. While we believe this measure is helpful, we note two problems with its formulation that the agency should address. First, MMS should clarify what constitutes an “aggregation” for avoidance purposes. As it stands, only the number of cow/calf pairs that must be observed is specified; but here the PEA is inconsistent, at one point limiting the number to 4 pairs and at another raising the bar to 12. PEA at 142-43. Given the difficulties of marine mammal monitoring, we believe the more conservative threshold should be set for cow/calf pairs; and the size of the aggregation that would trigger the larger safety zone should otherwise be defined (and defined conservatively). Second, MMS should consider an alternative that does not depend on the abilities of aerial monitors to enforce. Subsistence hunters report that some whales exhibit avoidance at distances up to 30 or 35 miles from an

“Maritime Exercise Areas Environmental Management Plan,” Procedure S-1 (June 9, 2004) (Australia requirements for tactical sonar training).

⁴³ The distinction between pinnipeds and cetaceans was raised by an expert panel convened during California’s High Energy Seismic Survey process in June 1997. In the end, the panel declined to recommend a higher exposure level for pinnipeds on the grounds that sufficient information was lacking. “Summary of Recommendations Made by the Expert Panel at the HESS Workshop on the Effects of Seismic Sound on Marine Mammals, Pepperdine University, Malibu, California, June 11-12, 1997” at 1, in High Energy Seismic Survey Team, High Energy Seismic Survey Review Process and Interim Operational Guidelines for Marine Surveys Offshore Southern California at App. 5 (1999). Nonetheless, the agency has capriciously adopted this distinction as though a recommendation had been made, in violation of both the Administrative Procedure Act and the Data Quality Act.

⁴⁴ See, e.g., D. Kastak, B.L. Southall, R.J. Schusterman, C.R. Kastak, Underwater Temporary Threshold Shift in Pinnipeds: Effects of Noise Level and Duration, 118 *Journal of the Acoustical Society of America* 3154, 3161 (2005); D. Kastak, R.J. Schusterman, B.L. Southall, and C.J. Reichmuth, Underwater Temporary Threshold Shift Induced by Octave-Band Noise in Three Species of Pinniped, 106 *Journal of the Acoustical Society of America* 1142, 1146 (1999).

⁴⁵ R.A. Kastelein, S. van der Heul, W.C. Verboom, R.J.V. Triesscheijn, and N.V. Jennings, The Influence of Underwater Data Transmission Sounds on the Displacement Behavior of Captive Harbour Seals (*Phoca vitulina*), 61 *Marine Environmental Research* 19 (2006).

array. PEA at 127.⁴⁶ It is unlikely that operators would be able to monitor effectively within an area of that size, particularly at higher sea states. Furthermore, fog and other bad weather conditions commonly inhibit aerial surveys. We therefore recommend that MMS exclude testing within 35 miles of the whale's historical migration corridors.

- (d) Field testing – Following other jurisdictions, the PEA requires that propagation distances for purposes of mitigation and monitoring be verified in the field before operations begin. The distance that seismic pulses travel can vary significantly, however, depending on oceanographic conditions such as bottom topography. Given that it is infeasible to constantly alter mitigation and monitoring zones in real time, we believe the conservative course is to establish a two-prong standard for each relevant isopleth. The default distance would be set according to a function of $20\log(r)$, and enlarged if field tests warrant. It is also important, for surveys that run across varied bathymetry, that operators retest propagation distances on entering shallow water. Such an approach is consistent with recent findings that propagation of airgun pulses surpassed expectations in shallow-water environments.⁴⁷
- (e) Conditions of Low Visibility – Adverse weather conditions can hinder or preclude visual monitoring of marine mammals, whether by ship or air, and particularly at night. For California, it is recommended that authorities halt surveys when conditions deteriorate to the point where visual observation becomes ineffective and where marine mammal densities are high enough to warrant concern.⁴⁸ Similarly, in this case, MMS should consider barring surveys where sea states exceed Beaufort 4, swells are greater than 3 meters, or thick fog prevails, except in areas where marine mammal densities are low, a condition that should be defined in advance. When surveys are permitted to proceed, it is imperative that passive acoustic monitoring be used. Surveys in inclement weather should be barred from waters near the bowhead whale migration corridor unless the 35 mile exclusion recommended at paragraph (c) above has been adopted.
- (f) Geographic Exclusion Zones – Geographic restriction has been recognized by the IWC Scientific Committee, by other international bodies, by some foreign governments, and by expert commentators as an essential mitigation measure for

⁴⁶ See also MMS's Beaufort Sea Lease Sale 195 (and 186), stipulation No. 4 (acknowledging that "experiences relayed by subsistence hunters indicate that, depending on the type of operations, some whales demonstrate avoidance behavior at distances of up to 35 miles").

⁴⁷ M. Tolstoy, J.B. Diebold, S.C. Webb, D.R. Bohnenstiehl, E. Chapp, R.C. Holmes, and M. Rawson, Broadband Calibration of R/V Ewing Seismic Sources, 31 *Geophysical Res. Letters* L14310 (2004).

⁴⁸ High Energy Seismic Survey Team, High Energy Seismic Survey Review Process and Interim Operational Guidelines for Marine Surveys Offshore Southern California 31 (1999).

marine mammals.⁴⁹ The designation of closed areas is particularly important for the Arctic given MMS' expectation that oil and gas leasing—and exploration—will increase significantly there, meaning that survey ships are likely to return to the same habitat year after year. It is therefore astonishing that MMS has made no attempt to define closed areas in the Beaufort and Chukchi seas. Preparing an EIS would have afforded the agency a better opportunity to do so, but MMS (and NMFS) still must consider closed areas within the current process. Furthermore, allowing these surveys to occur on an accelerated time scale prior to completion of the environmental impact statement of the new Five-Year leasing program, and of other planned lease sales for the Beaufort and Chukchi seas, prejudices the consideration of alternatives for the lease sales.

- (g) Reducing Source Levels – The PEA requires, as an additional measure, that applicants “use the lowest sound levels feasible to accomplish their data-collection needs.” PEA at 231. Reducing source levels, as by limiting the volume of airguns or the size of an array, is critical to reducing the size of a survey's impact area—but the requirement may have limited utility without verification. MMS should independently calculate the lowest sound levels needed to conduct each of the surveys proposed, and industry should be required to meet those levels or explain why they are impracticable. If there are environmental trade-offs between one configuration and another, the agency should indicate why a particular choice was made.
- (h) Horizontal Propagation – To minimize their impact area, it is important that operators configure their arrays to avoid horizontal propagation to the greatest extent practicable. Such a measure has been adopted by the Sakhalin Energy Investment Company (SEIC) for Phase 2 of its Sakhalin II project off the Russian coast.⁵⁰ According to NMFS, Shell has agreed to engineer its array to achieve maximum downward propagation (71 Fed. Reg. 26066), but this requirement is not included in the PEA. It should be established as a matter of course for all companies working in the Arctic.
- (i) Mitigation Research – Modifying a sound source to reduce its impacts is acknowledged to be another important and promising mitigation measure.⁵¹ For

⁴⁹ See, e.g., International Whaling Commission, 2004 Report of the Scientific Committee at Annex K and § 12.2.5.3; CONAMA [Brazil] -National Environment Council Res. 305 (July 2004) (excluding seismic exploration from Abrolhos Banks to protect humpback whales); Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea, and Contiguous Atlantic Area (ACCOBAMS) Res. 2.16, Adopted at the 2nd Meeting of Parties in Majorca, Spain (2004); IUCN-World Conservation Union, Resolution 53 (Undersea Noise Pollution), Adopted at the 3rd World Conservation Congress in Bangkok, Thailand (2004).

⁵⁰ SEIC, Western Gray Whale Environmental Impact Assessment: Draft 1, at Ch. 7.2 (2005).

⁵¹ See, e.g., J. Barlow and R. Gisiner, Mitigating, Monitoring and Assessing the Effects of Anthropogenic Sound on Beaked Whales, 7(3) *Journal of Cetacean Research and Management* (2006) (forthcoming).

example, operators off the U.K. are required to “seek methods” to baffle or reduce the unnecessary (and significant) higher frequency noise that seismic airguns produce; improved signal processing or the use of vibrational energy are other alternatives.⁵² As a condition of operating, industry should be required to contribute funding to an independent source to sponsor mitigation research. Such a requirement is analogous to the long-term research program required of the U.S. Navy as a condition of deploying the SURTASS LFA sonar system (67 Fed. Reg. 46712, 46782), and would help address the cumulative, long-term impacts of increased activity in the Arctic.

- (j) Avoiding Redundant Surveys – To justify its need for a particular survey, industry should be required to demonstrate that existing data sets cannot be used. Tens of thousands of miles of survey data from MMS’ Alaska region have already been released by the agency; if a relevant data set remains proprietary, the agency should require that industry purchase the data rather than shoot new line. Alternatively, and also as discussed above, MMS should consider performing a single survey in the Chukchi Sea, which applicants would be required to share.
- (k) Ballast Water – The spread of invasive species through ballast water is a serious international problem, recognized by the National Research Council and the International Maritime Organization, and one that poses a heightened risk for the Arctic in coming years.⁵³ Since the vessels used in the proposed surveys would come from outside Alaska, MMS must develop a plan with industry to prevent the introduction of foreign species. Basic mitigation would require operators, before entering the Alaska region, to (1) perform a ballast water exchange, (2) wash seismic survey equipment, and (3) clean their hulls.

MMS’s specific mitigation measures for fish are also insufficient and, for invertebrates, completely unaddressed. The agency proposes five mitigation measures for fish and fisheries: (1) a sequential ramp-up of the sound source; (2) the creation of a 15 kilometer “movement corridor” between the 160 dB isopleths of multiple airgun sources; (3) an exclusion zone of 1 kilometer from coastal or insular shores, based again on the 160 dB isopleth; (4) restrictions on the towing of cables and airgun arrays in fragile biocenoses; and (5) prohibitions on vessels anchoring in any fragile biocenoses.

While all of these mitigation measures are potentially useful, we believe that they should be strengthened as follows:

⁵² Joint Nature Conservation Committee, Guidelines at § 1.1 (baffling); M. Deffenbaugh, “Mitigating Seismic Impact on Marine Life: Current Practice and Future Technology,” *Biocoustics* vol. 12 (2002): pp. 316-18 and Barlow and Gisiner, Mitigating, Monitoring and Assessing (alternative sources).

⁵³ National Research Council, Stemming the Tide: Controlling Introductions of Nonindigenous Species by Ships’ Ballast Water (1996).

- (a) Movement Corridor – For purposes of locating the movement corridor, the fish displacement zone should be expanded from the 160 dB (re 1 μ Pa) isopleth to 33 kilometers, which would place the corridor for fish and fish stocks at a further distance from the array. Such a scheme is more consistent with existing studies, which shows fish stocks affected at least 33 kilometers around an airgun array.⁵⁴ By contrast, under the current plan, the entire movement corridor could fall within the acoustic shadow of two different seismic surveys, at levels known to significantly affect the behavior of at least some species of fish (e.g., cod).⁵⁵ Along the same lines, we would recommend that the movement corridor itself be expanded from 15 to 30 kilometers, to buffer against the possibility, left open by the same research, that fish are significantly displaced beyond 33 kilometers from the source.⁵⁶
- (b) Coastal Exclusion Zone – The 1 kilometer coastal and insular exclusion zone should be expanded to 1 kilometer or the 200m isobath, whichever is greater. As Table III.F.2 of the PEA demonstrates, providing minimum protection up to the 200m isobath would capture the majority of habitat utilized by fish species, particularly juvenile and spawning fish. This is particularly important with respect to arctic cod. As the PEA acknowledges:

Arctic cod are a significant prey species in the diets of marine mammals, birds, and other fishes and, thus, have been described as a ‘key species in the ecosystem of the Arctic Ocean’ (Quast, 1974; Craig et al., 1982). They are believed to be the most significant consumer of secondary production in the Alaskan Beaufort Sea (Frost and Lowry, 1983) and even to influence the distribution and movements of marine mammals and seabirds (Craig, 1984, citing Finlay and Gibb, 1982).⁵⁷

While adult cod can be found throughout the Chukchi and Beaufort seas, the PEA notes that arctic cod “contribute significantly to productivity in arctic coastal waters” and that juvenile cod are generally thought to inhabit coastal and neritic waters out to approximately 150m in depth.⁵⁸ An expanded coastal exclusion

⁵⁴ A. Engås, S. Løkkeborg, E. Ona, and A.V. Soldal, Effects of Seismic Shooting on Local Abundance and Catch Rates of Cod (*Gadus morhua*) and Haddock (*Melanogrammus aeglefinus*), 53 *Canadian Journal of Fisheries and Aquatic Sciences* 2238-49 (1996); see also S. Løkkeborg and A.V. Soldal, The Influence of Seismic Exploration with Airguns on Cod (*Gadus morhua*) Behaviour and Catch Rates, 196 *ICES Marine Science Symposium* 62-67 (1993).

⁵⁵ Id.

⁵⁶ The 33 kilometer distance represents the boundaries of the study area and not necessarily the extent of the area of impact. Id.

⁵⁷ PEA at App. B, p. 14.

⁵⁸ Id. at App. B, p. 14.

zone would also provide added protection for other important fish species such as migrating capelin, ciscos, whitefish, and salmon. Some of these species, such as Arctic cisco, are important subsistence resources by North Slope residents, and there is already concern about declining populations.⁵⁹

- (c) Shut-down Procedures – Commercially available “fish finders” should be required for use on all vessels. In the event that a vessel’s fish finder detects a school of fish within the 160 dB (re 1 μ Pa) isopleth of an operating air gun array, mandatory shut-down procedures should be required. Moreover, as with marine mammals, NMFS should prohibit the initiation of any ramp-up procedures until all large schools of fish are not detectable on the fish finders for at least thirty minutes.

NEPA requires consideration of these measures, and we note that similar or additional measures may be required under the Marine Mammal Protection Act, Endangered Species Act, and other statutes. We note, however, that even if these mitigation measures were adopted in full, they would not reduce the risk of impacts sufficiently to preclude the need for an EIS.

D. Impacts to Marine Life are Underestimated

Fundamental to satisfying NEPA’s requirement of fair and objective review, agencies must ensure the “professional integrity, including scientific integrity,” of the discussions and analyses that appear in environmental impact statements. 40 C.F.R. § 1502.24. To this end, they must make every attempt to obtain and disclose data necessary to their analysis. The simple assertion that “no information exists” will not suffice; unless the costs of obtaining the information are exorbitant, NEPA requires that it be obtained. See 40 C.F.R. § 1502.22(a). Agencies are further required to identify their methodologies, indicate when necessary information is incomplete or unavailable, acknowledge scientific disagreement and data gaps, and evaluate indeterminate adverse impacts based upon approaches or methods “generally accepted in the scientific community.” 40 C.F.R. §§ 1502.22(2), (4), 1502.24. Such requirements become acutely important in cases where, as here, so much about a program’s impacts depend on newly emerging science.

In this case, MMS’s assessment of impacts on marine life does not reflect the best available science and underestimates the extent to which the proposed surveys could disrupt the marine environment.

1. Acoustic Impacts to Marine Mammals

It is clear that MMS focused much attention in this PEA on the impact of seismic survey noise on marine mammals. Given the potentially very serious consequences to marine

⁵⁹ MMS, Proceedings of the Workshop on the Variability of Arctic Cisco (Qaaktaq) in the Colville River, MMS 2004-033.

mammals from the proposed surveys, including consequences to endangered bowhead whales, it is of paramount importance that this analysis be well-reasoned and based on the best available science. In several respects, MMS's analysis of this issue falls short.

First, MMS adopts noise-level thresholds for acoustic harassment that do not reflect sound science. At the core of MMS's assessment of acoustic impacts from the proposed seismic surveys are the thresholds it has established for physical injury, hearing loss, and significant behavioral harassment of marine mammals. PEA at 23 (adopting Level A harassment threshold at 180 dB for cetaceans and 190 dB for pinnipeds, and Level B harassment at 160 dB).⁶⁰ But recent literature indicates that very significant impacts to individuals and populations may occur at levels well below the 160 dB that MMS considers the minimum level at which behavioral harassment occurs.

For example, harbor porpoises have been reported to avoid a broad range of sounds—low-frequency (airgun pulses), mid-frequency (sonar transmissions), and high-frequency (acoustic harassment devices)—at very low sound-pressure levels (between 100 and 140 dB re 1 μ Pa).⁶¹ As MMS is aware, ongoing research on sperm whales in the Gulf of Mexico shows impacts to foraging behavior from seismic survey noise at received decibel levels much lower than MMS's threshold. Literature on grays, belugas, narwhals, and other species also indicate significant harassment at levels less than 160 dB.⁶²

Even MMS itself acknowledges that “bowhead whales apparently show some avoidance in areas of seismic sounds at levels lower than 120 dB,” PEA at 14, and that “the 120 dB isopleth is the approximate zone where Richardson et al. (1999) found at 20-km almost total bowhead whale exclusion.” PEA at 24 (emphasis added). By any measure, the “total exclusion” of bowhead whales from an approximately 1200 km² area is a significant behavioral harassment, and MMS's decision to set its threshold for harassment at a level *ten-thousand times* that which caused such a total exclusion is unsupportable.⁶³

⁶⁰ The problem with establishing a higher threshold for pinnipeds is discussed above in Section H.C.

⁶¹ See, e.g., R.A. Kastelein, H.T. Rippe, N. Vaughan, N.M. Schooneman, W.C. Verboom, and D. de Haan, The Effects of Acoustic Alarms on the Behavior of Harbor Porpoises in a Floating Pen, 16 *Marine Mammal Science* 46 (2000); P.F. Olesiuk, L.M. Nichol, M.J. Sowden, and J.K.B. Ford, Effect of the Sound Generated by an Acoustic Harassment Device on the Relative Abundance of Harbor Porpoises in Retreat Passage, British Columbia, 18 *Marine Mammal Science* 843 (2002); J. Calambokidis, D.E. Bain, and S.D. Osmek, Marine Mammal Research and Mitigation in Conjunction with Air Gun Operation for the USGS 'SHIPS' Seismic Surveys in 1998 (1998) (report to Minerals Management Service); NMFS, Assessment of Acoustic Exposures on Marine Mammals in Conjunction with USS Shoup Active Sonar Transmissions in the Eastern Strait of Juan de Fuca and Haro Strait, Washington, 5 May 2003 at 10 (2005).

⁶² For a summary of some of this research, see Richardson et al., *Marine Mammals and Noise* 255-57 (belugas and narwhals), 275-76 (belugas and narwhals), 298 (grays and bowheads),

⁶³ It should not be surprising that the scientific literature fails to support 160 dB as the level at which behavioral impacts are first seen, since MMS's choice of this level is essentially arbitrary and not the product of reasoned consideration of recent science. The level derives from a seven-year-old “interim” assessment of seismic survey impacts. See High Energy Seismic Survey Team, High Energy Seismic Survey Review Process and Interim Operational Guidelines for Marine Surveys Offshore Southern California at App. 5 (1999)

Nor do the thresholds employed account, in any way, for longer-term effects of noise exposure. MMS's acoustic thresholds are based solely on its assessment of immediate marine mammal responses, such as alteration of migration. The use of these thresholds ignores more subtle behavioral impacts on marine mammals, which might be expected to occur after weeks, months, and indeed years of seismic activities in these waters. This approach also does not fully account for the problem of repetition: the way that apparently insignificant impacts, such as subtle changes in dive times or vocalization patterns, can become significant if experienced repeatedly or over time.⁶⁴ The level at which such subtle changes occur could fall well below MMS's harassment threshold of 160 dB.

For all of these reasons, MMS should reassess its harassment thresholds for acoustic impacts to marine mammals to take into account the latest science, differences in reactions between species, and longer-term effects.

Second, MMS does not deal at all with the literature indicating that seismic surveys may result in whale strandings. In 2002, for example, two beaked whales (*Ziphius cavirostris*) were found to have stranded in the Gulf of California, Mexico, coincident with geophysical surveys that were being conducted in the area.⁶⁵ That same year, endangered adult humpback whales were reported to have stranded in unusually high numbers along Brazil's Abrolhos Banks, where oil-and-gas surveys were being conducted.⁶⁶ Neither paper is cited or discussed by MMS. Instead, MMS states summarily that "injuries directly from seismic survey noise are no [*sic*] expected to occur," without analysis of the risk of strandings. PEA at 120.

Even if MMS considers the possibility of seismic-related strandings remote, the law requires agencies to evaluate all "reasonably foreseeable" impacts, which, by definition, includes "impacts which have catastrophic consequences, even if their probability of occurrence is low, provided that the analysis of the impacts is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason." 42 C.F.R. § 1502.22. The scientific literature supporting strandings rises far above this

⁶⁴ The importance of this problem for marine mammal conservation is reflected in a recent NRC report, which calls for models that, inter alia, translate such subtle changes into disruptions in key activities like feeding and breeding that are significant for individual animals. National Research Council. Marine Mammal Populations and Ocean Noise: Determining When Noise Causes Biologically Significant Effects 35-68 (2005).

⁶⁵ Hildebrand, J., "Impacts of anthropogenic sound on cetaceans," Paper submitted to the IWC Scientific Committee (2004) (SC/56/E13).

⁶⁶ Engel, M.H., M.C.C. Marcondes, C.C.A. Martins, F. O Luna, R.P. Lima, and A. Campos, "Are seismic surveys responsible for cetacean strandings? An unusual mortality of adult humpback whales in Abrolhos Bank, Northeastern coast of Brazil," Paper submitted to the IWC Scientific Committee (2004) (SC/56/E28).

standard, and MMS's failure to deal with the possibility of strandings seriously is arbitrary and capricious.

Third, MMS does not adequately describe the potential disturbance that seismic surveys may have on mother walrus and dependent young. It fails to identify the range at which mother and dependent young may detect and avoid seismic operations or account for the possibility that dependent young may become separated from their mothers as a result of disturbance from seismic operations.

Fourth, MMS does not adequately describe the potential disturbance of seismic surveys to polar bears, whose swims along the coast and to ice floes well offshore are likely to be physiologically and energetically demanding. Polar bears are known to drown while making such swims. Especially in light of FWS's recent decision to consider listing polar bears under the Endangered Species Act, MMS should identify the range at which swimming bears may detect and attempt to avoid seismic vessels, describe the energetic costs of such avoidance, and give a thorough assessment of the impacts of such surveys to polar bear populations.

Fifth, MMS's calculation of permanent threshold shift (which it equates to the onset of injury) may be based on an improper model. A recent study of threshold shift in pinnipeds found that the amount of hearing loss an animal experiences does not increase linearly with the energy it receives. As the energy intensifies, its rate of hearing loss increases, to such a degree that projections of permanent threshold shift according to traditional, linear models are likely to result in underestimates of harm.⁶⁷ Given the uncertainties presented by this study, MMS should lower its estimate of auditory injury.

For all these reasons, MMS's analysis of the impacts of the proposed seismic surveys on marine mammals is inconsistent with the latest scientific literature on acoustic impacts, and, if adopted in a Record of Decision, would violate NEPA.

2. Acoustic Impacts on Fish and Fisheries

As the discussion of the scientific literature on the impact of ocean noise—and particularly of air guns—on fish and invertebrates makes clear, the proposed actions may have a significant effect on numerous species of fish and invertebrates. As a general matter, the PEA does a credible job in summarizing this literature. However, in a few instances the PEA misstates the conclusion of studies or makes unwarranted (and unconservative) extrapolations based upon others. As a result, the PEA's conclusion that the mitigation proposed will reduce the environmental impact of the proposed seismic surveys to a level below significance is dubious, at best.

⁶⁷ D. Kastak, B.L. Southall, R.J. Schusterman, C.R. Kastak, Underwater Temporary Threshold Shift in Pinnipeds: Effects of Noise Level and Duration, 118 *Journal of the Acoustical Society of America* 3154, 3161 (2005).

First, the PEA concludes that “sound sources that have resulted in documented physiological damage and mortality of adult, juvenile, and larval fish have all been at or above 180 dB re 1 μ Pa (Turnpenny and Nedwell, 1994).” PEA at 54. This conclusion ignores McCauley et al. (2000 and 2003), which found physiological damage (likely permanent) to the hair cells of the inner ears of adult fish.

Although it is true that McCauley et al. exposed fish to a maximum sound level of 182 dB re 1 mPa².s (193 dB re 1 mPa), the study also calculates when potentially damaging displacement of the hair cells began, concluding that “[t]he point at which the maximum displacement begins to rapidly increase lies between 155-160 dB re 1 mPa².s” or, using McCauley’s assumptions, approximately 166 - 171 re 1 μ Pa for a single pulse (see Figure 1, taken from McCauley et al. (2000)). Thus, the PEA’s implicit conclusion of that physiological damage or mortality to adult or juvenile fish will not be caused at levels below 180 dB re 1 μ Pa is unwarranted.

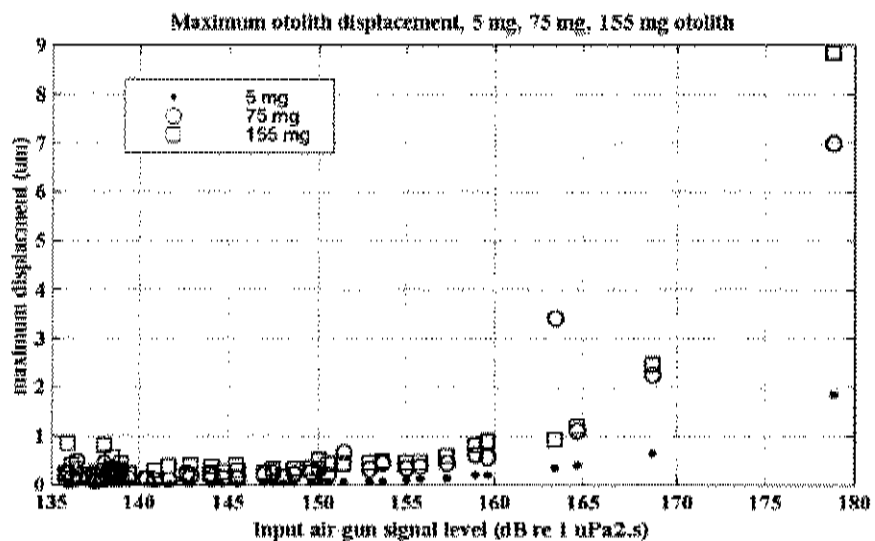


Figure 1: Calculated maximum otolith displacement for three otolith masses. (source: McCauley, et al. (2000))

Second, when discussing the widespread reductions in catch rates recorded by Engås, et al. 1996 and Løkkeborg and Soldal, 1993, the PEA states that the “affected area may extend to 33 km from a survey operated in waters 50-300 m in depth.” Again, this is an unconservative assumption that is not supported by either study. Neither Engås et al. 1996 nor Løkkeborg and Soldal 1993 conclude that a 33 km radius around an air gun array is the outer-most extent of a potential fish displacement area, as the PEA seems to assume. Rather, these studies simply did not survey catch rates beyond 33 km. Given the dramatic reduction in catch rates that resulted from these studies—as high as 80% in one survey—MMS should assume that the use of air gun arrays may exclude fish over greater distances.

Third, with regard to squid, the PEA concludes that “anticipated effects are limited to behavioral responses such as those noted and are regarded as negligible to squid

populations.” PEA at 63. Given the association between the multiple strandings and deaths of at least one species of squid to airguns—as well as the well-documented strong startle response exhibited by others—this conclusion is not supportable.⁶⁸ Instead, the PEA should assume that the use of airguns may cause both physiological injury and behavior changes in squid.

3. Other Impacts to Marine Life

Impacts from the proposed seismic surveys are not limited to the overt physiological and behavioral effects of ocean noise. Risks from increased vessel traffic, invasive species, and potential oil spills are significant but not well analyzed by the PEA.

Vessel traffic will consist of seismic survey vessels and associated support vessels, including icebreakers and fuel-supply ships. Table I.C-1. Along with this increased traffic comes an increased risk of ship strikes, which may be exacerbated by temporary or permanent hearing damage caused by the seismic activity being conducted. Each time fuel is supplied to these vessels, there is some risk of a fuel spill. And since these vessels will be entering Alaskan waters from outside waters, they also bring with them a serious risk of introducing invasive species—especially since simple mitigation measures such as requiring ballast water exchanges outside Alaska’s EEZ, recent hull cleaning and washing of survey equipment do not appear to be required.⁶⁹ The introduction of non-native species to Alaska poses potentially significant ecological and social impacts. MMS must evaluate impacts and propose mitigation for each of these categories of harm. 42 C.F.R. §§ 1502.14, 1502.16.

E. Segmentation of Analysis

“Significance cannot be avoided by . . . breaking [an action] down into small component parts.” 40 C.F.R. § 1508.27(b)(7). As discussed above, MMS projects that this summer of intensive surveying will be only the first of at least five summers of seismic surveys of comparable intensity in these waters. Table III.C-1. All of these seismic surveys will occur in the Beaufort and Chukchi seas, and all are related to the development of oil and gas leases in these waters. If, as MMS concedes, “large numbers (hundreds) of bowheads could potentially be disturbed by the survey activity or could be excluded by avoidance from habitat for the period the surveys were occurring” this summer alone, PEA at 133, it must consider very carefully, and in one coordinated analysis, the effects of such widespread exclusions from habitat occurring summer after summer. This is especially true given the importance of these waters to bowhead whales, which may increasingly depend on feeding in the Beaufort Sea as prey availability declines in the Bering Sea and

⁶⁸ Angel Guerra, Institute for Marine Investigations, Vigo, Spain, Presentation to the Annual Science Conference of the International Council for the Exploration of the Sea (2004).

⁶⁹ See Gollasch, S. 2002. The importance of ship hull fouling as a vector of species introductions into the North Sea. *Biofouling* 18(2):105-121.

elsewhere. PEA at 96. The same problem holds for other species, which may suffer declines in foraging or reproductive success year and year.

Because these future seismic surveys are foreseeable, are part of a comprehensive effort to develop these waters for oil and gas leases, and raise substantial questions that they will individually and collectively result in significant impacts to the environment, they must be analyzed in one comprehensive EIS. See Blue Mountains Biodiversity Project v. Blackwood, 161 F.3d 1208, 1215 (9th Cir. 1998).

F. Cumulative Impacts

In order to satisfy NEPA, an environmental analysis must include a “full and fair discussion of significant environmental impacts.” 40 C.F.R. § 1502.1. It is not enough, for purposes of this discussion, to consider the proposed action in isolation, divorced from other public and private activities that impinge on the same resource; rather, it is incumbent on MMS to assess cumulative impacts as well, including the “impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future significant actions.” Id. § 1508.7. Cumulative impacts “can result from individually minor but collectively significant actions taking place over a period of time.” 42 C.F.R. § 1508.7. Thus, for example, it is necessary to consider the impacts of the proposed surveys alongside existing oil and gas industry activities in the region, as well as other industrial, military and commercial activities such as fishing, shipping, and military training.

MMS fails to account adequately for several important impacts that pose risks to affected species on top of the seismic surveys being assessed.

First, MMS does not provide a sufficient assessment of the impacts of year-on-year seismic surveying in the Beaufort and Chukchi seas. Again, MMS projects that this summer of intensive surveying will be only the first of at least five summers of seismic surveys of comparable intensity in these waters, Table III.C-1. In order to avoid improper segmentation of impacts from these surveys, MMS must analyze these related and foreseeable surveys in one programmatic EIS. See supra at II.E. Barring such an analysis, these year-on-year surveys must be comprehensively analyzed as cumulative impacts in the environmental documentation for this year’s surveys, taking proper care to assess impacts on breeding, energetics, feeding, migration, and long-term stress to the populations of affected species.

Second, it appears that MMS fails to account for some of the many other oil and gas activities slated to occur in these waters this summer. For example, Petroleum News has reported, and Shell has confirmed, that Shell plans to drill exploration wells in the Beaufort Sea during the summer of 2007. In order to prepare for this drilling, Shell has purchased a new vessel and intends to excavate “well cellars” or glory holes this summer in order to protect well equipment, such as blowout preventers, from ice scouring. Shell

will excavate 30 to 40 feet into the seafloor. An ice-breaker may be used to permit passage of the vessel used to excavate the well cellar. The vessel will need to be transported to the area and back to its storage site, fueling vessels will be needed as well as likely helicopter and other support.

MMS needs to address any potential cumulative effects from Shell's proposed construction of "well cellars" in the Beaufort Sea. Further, those activities must be properly permitted by MMS or part of an approved exploration plan submitted by Shell. Excavating well cellars does not constitute an ancillary activity. Ancillary activities are only those activities intended to obtain data and information relating to the presence of oil and gas or obtain data on the safety of drilling an exploration well. *See* 30 C.F.R. § 250.105 (defining "ancillary activities"; *id.* § 250.207 (explaining what "ancillary activities" include). They do not include creating glory holes or well cellars because such holes are intended to protect well equipment, such as blowout preventers, from ice scouring. Excavating well cellars thus has nothing to do with data collection about the presence of oil and gas.

Third, cumulative impacts must include a description of seismic testing that is ongoing or planned to occur in the Canadian Beaufort Sea, along with an analysis of how that surveying will potentially magnify impacts to marine species, including especially impacts to species with habitat in both waters.

Other unassessed or inadequately assessed cumulative impacts include impacts of climate change; impacts of foreseeable oil and gas leasing, exploration, and production activities occurring in these waters this year and in the seasons to come; impacts of fishing and subsistence activities; impacts of local and transboundary pollutants on marine life; risks of oil and other spills; and impacts of other industrial and military activities in the region. The risks posed by each of these activities to impacted resources should be assessed, and any resulting direct or indirect mortalities should be estimated so that an overall picture of threats to populations can be considered.

G. Compliance with Other Applicable Laws

MMS has stated its intention to require an Incidental Harassment Authorization under the Marine Mammal Protection Act for these surveys (PEA at 5). We will submit comments regarding applications to NMFS and FWS under the MMPA at the appropriate time. But other statutes and conventions also apply to MMS's proposal and include:

1. The Endangered Species Act, 16 U.S.C. § 1531 et seq., which requires MMS to enter into formal consultation with NMFS or the U.S. Fish and Wildlife Service, and receive a legally valid Incidental Take Permit, prior to its "take" of any endangered or threatened marine mammals or other species, including fish, sea turtles, and birds, or its "adverse modification" of critical habitat. See, e.g., 1536(a)(2); Romero-Barcelo v. Brown, 643 F.2d 835 (1st Cir. 1981), rev'd on other grounds, Weinberger v. Romero-Carcelo, 456 U.S. 304, 313 (1982). While MMS

states that it has submitted a biological evaluation to NMFS and to FWS regarding impacts to listed species from these surveys, it is unclear what other steps MMS and the agencies intend to take, if any, to comply with these requirements. See PEA at 2. Issuance of an Incidental Take Permit is required before MMS can permit the proposed surveys to go forward.

2. The Coastal Zone Management Act, and in particular its federal consistency requirements, 16 U.S.C. § 1456(c)(1)(A), which mandate that activities that affect the natural resources of the coastal zone—whether they are located “within or outside the coastal zone”—be carried out “in a manner which is consistent to the maximum extent practicable with the enforceable policies of approved State management programs.” It is unclear whether MMS intends to apply to the relevant Alaska state agency (or agencies) for review.

3. The Magnuson-Stevens Fisheries Conservation and Management Act, 16 U.S.C. § 1801 *et seq.* (“MSA”), which requires federal agencies to “consult with the Secretary [of Commerce] with respect to any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken” that “may adversely affect any essential fish habitat” identified under that Act. 16 U.S.C. § 1855 (b)(2). In turn, the MSA defines essential fish habitat as “those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity.” 16 U.S.C. § 1802 (10). As discussed at length above, the surveys proposed have the significant potential to adversely affect both fish habitat, including EFH. Yet MMS does not indicate whether it plans to consult with the Secretary of commerce concerning these activities or to implement measures recommended by NMFS to protect EFH, instead emphasizing that these measures are “advisory, not proscriptive.” PEA at 3. Under the MSA, a thorough consultation is required and we urge MMS to employ all measures recommended by NMFS to protect fish habitat.

4. The Migratory Bird Treaty Act, 16 U.S.C. § 703 *et seq.* (“MBTA”), which makes it illegal for any person, including any agency of the Federal government, “by any means or in any manner, to pursue, hunt, take, capture, [or] kill” any migratory birds except as permitted by regulation. 16 U.S.C. § 703. The District Court for the D.C. Circuit has held that federal agency activities that incidentally take migratory birds without a permit violate the MBTA, see Center for Biological Diversity v. Pirie, 191 F. Supp. 2d 161 (D.D.C. 2002) (later vacated as moot).

5. The Outer Continental Shelf Lands Act Amendments. OCSLAA requires MMS to develop adequate baseline environmental studies information designed to predict impacts on the marine biota (43 U.S.C. Sec. 1346(a)) and to conduct additional monitoring studies “to monitor the human, marine, and coastal environments of such an area or region to provide time-series and data-trend information which can be used for comparison with previously collected data to identify important changes in the quality and productivity of such environments, to establish trends in the areas studied and monitored...” (43 U.S.C. Sec. 1346(b)).

There have been few baseline studies in the Chukchi Sea during the past 15 years since an earlier leasing program, yet during this time there has been significant global warming with changes in marine populations, distributions, and habitats.

Permitting of the proposed seismic surveys cannot go forward absent compliance with these laws.

H. Failure to properly publicize the PEA

Under the Council of Environmental Quality's regulations, agencies must "[p]rovide public notice of NEPA-related hearings, public meetings, and the availability of environmental documents so as to inform those persons and agencies who may be interested or affected." 40 C.F.R. § 1506.6(b). When the action involves effects of national concern, the agency must publish the notice in the Federal Register. See 40 C.F.R. § 1506.6(b)(2) ("In the case of an action with effects of national concern notice shall include publication in the FEDERAL REGISTER and notice by mail to national organizations reasonably expected to be interested in the matter and may include listing in the 102 Monitor"). Here, MMS failed to publish the PEA in the Federal Register despite the clear national concern over the proposed seismic surveys.

The proposed seismic activities are part of MMS's national offshore oil and gas program. Ocean noise, and particularly sound generated by seismic activities, is an issue of major importance throughout the United States and has recently been the subject of significant study. To take just a few examples, the National Research Council and the Natural Resources Defense Council both released studies in 2005 concerning impacts on marine mammal populations and fish from ocean noise, including seismic activities.⁷⁰ The National Research Council also released a study in 2003 that focused exclusively on the effects of oil and gas activities in the Arctic, and a prior National Research Council study focused on insufficient environmental information for assessing offshore oil and gas impacts.⁷¹

Further, as evidenced by the comments from individuals and organizations across the nation that MMS received on its proposed five-year offshore oil and gas leasing program, an overwhelming number of U.S. citizens are concerned about the risks to the Arctic ecosystem, marine and terrestrial wildlife, and natural environment from offshore oil and gas activities, including seismic surveys. The perennial and national fight over opening

⁷⁰ See National Research Council, "Marine Mammal Populations and Ocean Noise. Determining When Noise Causes Biologically Significant Effects" (2005); Natural Resources Defense Council, "Sounding the Depths II: The Rising Toll of Sonar, Shipping and Industrial Ocean Noise on Marine Life" (2005). See also National Research Council, "Ocean Noise and Marine Mammals" (2003).

⁷¹ See National Research Council, "Cumulative Environmental Effects of Oil and Gas Activities on Alaska's North Slope" (2003); National Research Council, "Environmental Information for Outer Continental Shelf Oil and Gas Decisions in Alaska" (1994).

the Arctic National Wildlife Refuge, which lies immediately adjacent to the Beaufort Sea, to oil and gas drilling further illustrates this overwhelming and broad concern.

Because the proposed activities addressed in the PEA involve effects of national concern, MMS must publish a notice of the document in the Federal Register and provide a new 30-day period for accepting public comments. Doing otherwise prevents potentially significant numbers of citizens from weighing in on these critical questions and leaves MMS vulnerable to criticism that it eschewed a fair and open debate about these decisions.

There is also an environmental justice issue of national concern due to the disproportionate impacts to Alaska Native Inupiat communities whose subsistence resources and access, culture, and social impacts from the surveys will be significant.

I. Alternatives Analysis Under Section 102(2)(E) of NEPA

Above and beyond the EIS requirement, NEPA directs agencies to “study, develop, and describe appropriate alternatives” to any project that presents “unresolved conflicts concerning alternative uses of available resources.” 42 U.S.C. § 4332(2)(E). Courts have concluded that this duty is “both independent of, and broader than, the EIS requirement.” Bob Marshall Alliance v. Hodel, 852 F.2d 1223, 1229 (9th Cir. 1988), cert. denied, 109 S.Ct. 1340 (1989). Because seismic surveying of these waters presents “unresolved conflicts” about the proper use of “available resources,” MMS must explicitly address its separate and independent obligations under section 4332(2)(E).

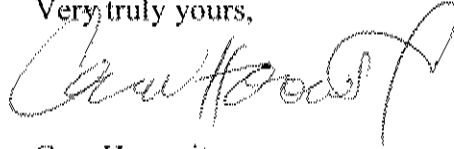
III. CONCLUSION

For the reasons set forth above, we urge MMS to recognize that bombarding these remote waters, which provide important habitat for endangered bowhead whales and other species, with many months of intensive seismic survey noise will have significant impacts that must be analyzed in a full EIS. Only after an EIS is prepared and properly disseminated will the public and relevant decisionmakers be able to determine whether the proposed surveys are worth the considerable risk they pose to the environment and to Native communities.

Mr. Rance R. Wall
May 10, 2006
Page 37

Thank you for your time and attention.

Very truly yours,



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