



March 13, 2019

Coastal Plain Oil and Gas Leasing Program EIS
222 West 7th Avenue, Stop #13
Anchorage, Alaska 99513 -7504
Attn: BLM Project Coordinator Nicole Hayes
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RE: Comments on Draft Coastal Plain Oil and Gas Leasing Program EIS

SUBMITTED ON-LINE VIA EPLANNING SITE AND EMAIL¹

Dear Project Coordinator Hayes,

On behalf of the Sierra Club, I am writing to submit the attached expert analysis of BLM's Draft Environmental Impact Statement (DEIS) for the Coastal Plain Oil and Gas Leasing Program, prepared by Dr. Steven Amstrup, Chief Scientist for Polar Bears International. Sierra Club retained Dr. Amstrup's expert services through Polar Bears International to provide an assessment of the impact of the proposed oil and gas activities on polar bears, and an evaluation of the DEIS. To supplement its comments filed jointly with numerous other environmental organizations, Sierra Club is also submitting this separate comment letter to emphasize certain additional points associated with the impacts to polar bears, and serious deficiencies in the DEIS, that Dr. Amstrup's analysis illuminates.

The Sierra Club was founded in 1892 and is the nation's oldest grassroots environmental organization. The Sierra Club is incorporated in California, and has more than 790,000 members nationwide, with approximately 1,865 members in its Alaska Chapter alone. The organization is dedicated to the protection and preservation of the environment. The Sierra Club's mission is to explore, enjoy and protect the wild places of the earth; to practice and promote the responsible use of the earth's ecosystems and resources; and to educate and enlist humanity to protect and restore the quality of the natural and human environments. The Sierra Club has members who have visited the Coastal Plain of the Arctic National Wildlife Refuge, and who have recreated in

¹ Please note that the full text of all of the literature cited in connection with this comment letter and the attached expert analysis from Dr. Steven Amstrup will have been timely submitted to BLM in hard copy format (a thumb drive or DVD) in connection with comments that Sierra Club is filing jointly with numerous other environmental organizations.

or near the areas potentially affected by the proposed oil and gas activities contemplated in this DEIS, enjoying the Coastal Plain for activities such as wildlife viewing, as well as for spiritual, aesthetic, or environmental purposes.

The Arctic National Wildlife Refuge (“the Refuge”) is the largest and wildest of our nation’s wildlife refuges. The Coastal Plain is the biological heart of the Refuge, providing essential habitat for a variety of wildlife, including imperiled polar bears, the Porcupine caribou herd and hundreds of species of migratory birds. It is an area sacred to the Gwich’in Nation, who depend on the Refuge for their way of life.

With regard to polar bears, BLM has failed to develop and evaluate the action alternatives in light of its affirmative obligation to provide for the conservation of the species, and the Secretary of Interior’s legal obligation to ensure that the original and primary purposes of the Refuge—which expressly include conserving polar bears and other species in their natural diversity—will continue to be fulfilled.² BLM has also improperly obscured the magnitude and severity of the impacts that the proposed action alternatives will have on polar bears by, inter alia, exaggerating the effectiveness of mitigation measures, failing to acknowledge important scientific distinctions between the Coastal Plain and other habitats in the region where oil and gas activities have taken place, failing to rationally reconcile its conclusions with the realities of climate change, and failing to provide a meaningful analysis of the impacts that polar bears will suffer as a result of the proposed program and other industrial development in the same region.

I. BLM’s Alternatives Analysis Fails to Address Affirmative Obligations to Conserve Polar Bears

The assessment of action alternatives in the DEIS is defective because BLM has failed to develop and evaluate the action alternatives with regard to BLM and the Secretary’s overarching legal obligations to conserve polar bears. These obligations encompass affirmative duties to take actions to recover the species and to maintain the Coastal Plain as a refuge for polar bears. These obligations arise from the Endangered Species Act (ESA), as well as from the Alaska National Interest Lands Conservation Act (ANILCA) and National Wildlife Refuge System Administration Act (Refuge Act).

Polar bears are listed as a threatened species under the ESA. Section 7(a)(1) of the ESA requires all federal agencies to “utilize their authorities in furtherance of the purposes of this chapter by carrying out programs for the conservation of endangered species and threatened species listed pursuant to [the ESA].” 16 U.S.C. § 1536(a)(1).³ “Conservation” means to use all

² See ANILCA § 303(2)(B)(i), (ii); see also ANILCA § 305; Public Land Order 2214, Establishing the Arctic National Wildlife Range at 1 (Dec. 6, 1960); FWS Refuge Management Part 601 National Wildlife Refuge System, 601 FW 1 at 1.16 (July 26, 2006); U.S. Fish and Wildlife Service, Arctic National Wildlife Refuge, Revised Comprehensive Conservation Plan Final Environmental Impact Statement, Chapter 1 at 1-21.

³ This duty applies to the agencies under the Secretary of Interior, and even to the U.S. Fish and Wildlife Service’s administration and implementation of the ESA itself. *Defs. of Wildlife v. Sec’y, U.S. Dep’t of the Interior*, 354 F. Supp. 2d 1156, 1173 (D. Or. 2005) (rejecting the

necessary methods and procedures to bring any listed species to the point at which ESA protections are no longer necessary. 16 U.S.C. § 1532. “[S]ection 7(a)(1) imposes a specific obligation upon all federal agencies to carry out programs to conserve each endangered and threatened species.” *Fla. Key Deer v. Paulison*, 522 F.3d 1133, 1146 (11th Cir. 2008) (citing *Sierra Club v. Glickman*, 156 F.3d 606, 616 (5th Cir.1998)). “Total inaction is not allowed.” *Id.* (citing *Glickman*, 156 F.3d at 617–18; *Nat’l Wildlife Fed’n*, 332 F.Supp.2d 170, 187 (D. D.C. 2004) (section 7(a)(1) confers discretion, but that “discretion is not so broad as to excuse total inaction”); *Defenders of Wildlife v. Sec’y, U.S. Dep’t of the Interior*, 354 F.Supp.2d 1156, 1174 (D. Or. 2005) (“compliance is not committed to agency discretion by law”)). “[W]hile agencies might have discretion in selecting a particular program to conserve...they must in fact carry out a program to conserve, and not an ‘insignificant’ measure that does not, or is not reasonably likely to, conserve endangered or threatened species. To hold otherwise would turn the modest command of section 7(a)(1) into no command at all by allowing agencies to satisfy their obligations with what amounts to total inaction.” *Fla. Key Deer v. Paulison*, 522 F.3d at 1147.

In addition to the ESA obligation to promote the conservation of the species as a whole, BLM must consider that ANILCA and the Refuge Act impose obligations on the Secretary of Interior to ensure that the primary purposes of the Refuge will continue to be satisfied. ANILCA makes clear that the first purpose of the Refuge, “for which the Arctic National Wildlife Refuge [was] established and shall be managed” is:

(i) to conserve fish and wildlife populations and habitats in their natural diversity including, but not limited to, the Porcupine caribou herd (including participation in coordinated ecological studies and management of this herd and the Western Arctic caribou herd), polar bears, grizzly bears, muskox, Dall sheep, wolves, wolverines, snow geese, peregrine falcons and other migratory birds and Arctic char and grayling;

94 STAT. 2390, P. L. 96–487 (Dec. 2, 1980), ANILCA Sec. 303(2). The Refuge Act in turn requires the Secretary of Interior to “provide for the conservation of fish, wildlife, and plants, and their habitats within the [Refuge] System,” 16 U.S.C. § 668dd(a)(4)(A), and “ensure that the biological integrity, diversity, and environmental health of the System are maintained for the benefit of present and future generations of Americans,” *id.* at § 668dd(a)(4)(B). Consequently, ANILCA and the Refuge Act impose a specific obligation to conserve the polar bear population utilizing the Refuge. This is a distinct obligation from conserving the species as a whole, or the Southern Beaufort Sea population (stock), as it specifically requires protecting and promoting the welfare of the portion of the population using the Refuge.

Secretary’s argument that section 7(a)(1) does not apply to FWS as inconsistent with ESA section 2(c)(1), 16 U.S.C. § 1531(c)(1) which provides: “[i]t is further declared to be the policy of Congress that *all Federal departments and agencies* shall seek to conserve endangered species and threatened species.”); *Nat’l Wildlife Fed’n v. Norton*, 386 F. Supp. 2d 553, 567 (D. Vt. 2005) (same).

A. BLM Has Failed to Evaluate Whether Its Proposed Action Alternatives Are Consistent with Affirmative Obligations to Conserve Polar Bears

The evaluation of impacts in the DEIS focuses on the extent to which the proposed action alternatives will cause negative impacts to polar bears, but at no point does the DEIS evaluate whether the alternatives are consistent with affirmatively promoting the conservation of polar bears at either the species level, population level, or subpopulation level (i.e., the bears using the Refuge). As described in more detail below, and in Dr. Amstrup's analysis, the DEIS repeatedly obscures the significant impacts to polar bears by asserting that mitigation measures will reduce the impacts. But beyond this serious and legally fatal defect, the DEIS also fails to measure the residual negative impacts to polar bears from the proposed oil and gas program with respect to whether those impacts can be reconciled with the obligations to provide positive conservation benefits to the species to ensure its recovery, as well as ensure the continued existence of polar bears within the Refuge in proportions consistent with a "natural diversity" of wildlife. At no point does the DEIS consider BLM's agency-specific obligation to use its authorities to provide for polar bears recovering to the point at which the protections of the ESA will no longer be necessary. The DEIS provides no explanation of how BLM intends to fulfill this important ESA obligation, which is distinct from the ESA obligation merely to ensure that its actions do not cause jeopardy to the species by undermining its survival or recovery. Further, at no point does the DEIS evaluate whether the action alternatives will violate the requirement imposed on the Secretary to ensure that polar bears continue to be present in the Coastal Plain in numbers maintaining a "natural diversity" of wildlife or ensuring the "biological integrity" of the Refuge. The DEIS is thus legally faulty with respect to NEPA obligations because it ignores the question of whether the alternatives are lawful in light of the affirmative conservation obligations imposed by substantive laws, and weighs impacts without regard for how its actions will undermine the provision of benefits to the species.

B. BLM Has Failed to Analyze Any Action Alternative that Will Satisfy Affirmative Conservation Obligations to Polar Bears

All of the action alternatives contemplated by the DEIS will result in net harm to polar bears. None of the action alternatives confer any positive benefits on the species. Moreover, the DEIS concedes that the additive cumulative effect of the proposed program alternatives with other development "may reach a level at which such effects become problematic for polar bears."⁴ BLM fails to consider any alternative that would impose a net benefit standard for mitigation or compensatory mitigation for impacts to polar bears associated with leasing and related oil and gas activities. Nor has BLM evaluated the feasibility of any action alternatives that would provide for no net loss by ensuring application and enforcement of mitigation measures or other stipulations that will avoid, eliminate, or compensate for all negative impacts to polar bears and their habitat. The DEIS explicitly states that BLM considers the no action alternative to be one that it cannot lawfully adopt, and that it is presenting it only for the purposes of a basis of comparison. Yet BLM has totally failed to consider any other alternatives

⁴ DEIS vol. 1 at 3-148.

that would be consistent with providing a benefit to polar bears, or even maintaining the level of benefits provided by the current management plan for the Refuge. BLM has also totally failed to consider any alternative that would avoid additive cumulative effects that become “problematic” for the species.⁵ All of the action alternatives it contemplates would have that effect, and yet the DEIS does not even attempt to address whether there are possible action alternatives that could avoid “problematic” consequences for the species. In addition to the devastating impacts from development activities, the DEIS concedes that oil production from the action alternatives will be of a magnitude that stimulates domestic demand for oil, resulting in a net increase in greenhouse gas emissions. Although the DEIS fails to adequately analyze those impacts, as explained in detail in our separately filed joint comments and here, BLM also has failed to analyze how exacerbating climate change comports with conserving polar bears. The DEIS fails to consider any alternative that would defer emissions by delaying production on leases. Nor does it consider any alternatives that would require lessees to provide compensatory mitigation via carbon offsets. This failure violates NEPA’s procedural requirement to evaluate alternatives. Further, in selecting among these harmful action alternatives prior to engaging in any analysis to ensure those alternatives will not preclude or limit options for fulfilling its ESA section 7(a)(1) obligations to use its authorities to recover the species, BLM also would violate the ESA by flouting its substantive duty under section 7(a)(1).

Similarly, BLM has failed to analyze any alternative that will comport with the Secretary’s duty to conserve the subpopulation of polar bears utilizing the Refuge. At present, the only plan that details how the Secretary will meet his obligations under the Refuge Act and ANILCA is the Arctic National Wildlife Refuge Comprehensive Conservation Plan (CCP). That Plan currently does not account for oil and gas activities taking place on the Coastal Plain and oil and gas development is currently inconsistent with the CCP. Consequently, the CCP does not set forth how the Secretary will continue to satisfy his duties to ensure the primary purposes of the Refuge are met in light of the proposed oil and gas program. None of the action alternatives will preserve the status quo of the CCP in terms of providing for polar bears. All of the action alternatives will result in negative impacts to the persistence of polar bears from the Southern Beaufort Sea in the Refuge, and fail to provide measures to protect those polar bears from the lethal consequences of oil and gas activities occurring in the Refuge. All of the action alternatives have additive negative impacts that “may become problematic” for the polar bears.⁶ None of the action alternatives provide for any measures to reduce the net harm to zero and therefore maintain the level of benefit to polar bears that the CCP deemed appropriate to fulfill the Secretary’s obligations. BLM has not even tried to develop an alternative that purports to maintain conditions for polar bears in the Refuge at the protective baseline of the CCP. Nor has it discussed an alternative that would avoid “problematic” consequences. Thus, BLM has failed to consider any alternative that meets the Secretary’s obligations to conserve polar bears.

⁵ DEIS vol. 1 at 3-148.

⁶ DEIS vol. 1 at 3-148.

II. BLM Has Failed to Take a Hard Look at the Impacts of the Proposal on Polar Bears

A. The DEIS Obscures the Impacts on Polar Bears by Exaggerating the Effectiveness of Avoidance and Mitigation Measures

The DEIS obscures the impacts of the proposed action alternatives on polar bears by relying on inherently faulty assumptions about the effectiveness of mitigation measures, failing to evaluate the effectiveness of those measures with regard to scientifically distinct features of the Coastal Plain, and making misleading statements that do not address the very high failure rate of those mitigation measures.

The DEIS states the conclusion that:

In summary, although the potential for injury or mortality could be high when developing new oil and gas projects in polar bear habitat, the risks are well understood. Also, effective mitigation is available and has been implemented in the established North Slope oilfields west of the program area. With mitigation in place, the net effects of program-related activities are likely to be negligible in terms of injury and mortality at the population level. Given the current and predicted continuing decline of the SBS stock of polar bears, emphasis would be placed on avoiding injury or mortality, and current mitigation measures appear to be effective at reducing such risks.

DEIS at 3-142. A key mitigation measure that the DEIS repeatedly expressly relies upon is denning surveys.⁷ Because dens are essentially invisible to the naked eye, polar bear denning surveys are conducted through aerial surveys using forward-looking infrared cameras (FLIR) prior to oil and gas activities taking place in an area. Theoretically, these surveys can avoid or reduce harm to mother bears and cubs from disturbing dens by locating the den in advance of the harmful activities, and then keeping those activities at a buffer distance from the den. However, as explained by Dr. Amstrup, these FLIR den detection surveys can be expected to totally **fail to**

⁷ See, e.g., DEIS vol. 1 at 3-141 (“In addition to attraction to areas of human activity and direct interaction with humans, a second potential source of injury or mortality is premature den abandonment, which is a possible outcome of den disturbance and has been documented as an adverse effect on cub survival (Amstrup and Gardner 1994; USFWS 2008b, 2009; 76 FR 47010; 81 FR 52276). The precautions against den disturbance in the interaction plan, required under ITRs, *and the denning surveys* conducted before seismic exploration and construction of roads and pads *would minimize the likelihood of this potential risk.*”) (emphasis added); *id.* at 3-138 (“Behavioral disturbance on the productivity of polar bears in the program area is likely to be low. *This assumes that all mitigative measures are implemented*, as required under ITRs and specified in typical wildlife interaction plans for industrial activity in Arctic Alaska, *and that preconstruction den surveys detect most maternal dens* in the affected areas.”) (emphasis added); *id.* at 3-137 (relying on the use of surveys to assert that ITRs will ensure that impacts on occupied dens are “negligible”).

detect 50% of the occupied dens in a given survey area.⁸ Moreover, as Dr. Amstrup explains, the failure rate would very likely be *even higher* for sites within the Coastal Plain due to the increased complexity of the landscape features compared to the nearby areas outside the Refuge where polar bear den detection surveys have been conducted in the past.⁹ Obviously, mitigation measures that turn on locating and keeping an avoidance buffer around dens can provide no benefit if the dens cannot be located in the first place, or are only located via activities that disturb them, thereby causing the very harm that the detection survey seeks to avoid. Yet the DEIS provides no discussion of this high failure rate, nor of how it affects the BLM's reliance on this mitigation measure to conclude that impacts will be negligible. Moreover, the DEIS fails to consider whether den-detection methods will be even less successful when applied in the Coastal Plain as compared to the nearby areas where those methods have been used in the past.

The DEIS also mentions the use of dogs as a den-detection method, but totally fails to acknowledge that as a practical matter, den-sniffing dogs can only be used to verify whether a den detected by FLIR is actually a den, or to search a relatively small area, not the large expanses that would be subject to oil and gas exploration activities such as seismic surveys for oil and gas.¹⁰ Moreover, the DEIS ignores the reality that sniffer dogs themselves can cause harmful disturbances to polar bear dens, and that the sniffer dogs must be transported via vehicles that cause harmful disturbances to polar bear dens.¹¹

Instead of acknowledging the important fact that such den detection surveys will fail to detect *more than half* of the occupied den sites within a given surveyed area in the Coastal Plain, the DEIS makes multiple statements misleadingly suggesting that the surveys are highly effective. For example, on page 3-146, the DEIS asserts that only a "small" number of bears would be affected by the failure to detect dens; on page 3-134 the DEIS says that the use of FLIR and dogs has proven to be effective, even though the results are not "perfect" and dens are "sometimes" missed. These statements do not at all convey the reality that *more than half* of the dens that may be affected by harmful activities will remain undetected.

As described in Dr. Amstrup's attached comments, the consequences of this high rate of failure to detect would be disastrous for reasonably foreseeable activities such as a seismic survey covering sizable portions of the Coastal Plain during a given denning season. A seismic survey would likely disturb nearly every undetected den within the bounds of the survey.¹² Taking into account that there may be up to 29 dens total, and that half of those (~15) would not be detected prior to disturbing activities, a Coastal Plain-wide oil and gas seismic exploration survey would likely disturb up to 14 out of the 15 dens, with potentially lethal latent

⁸ See Amstrup March 2019 Letter (Attachment 1) at 11–12, 22–23.

⁹ See Amstrup March 2019 Letter at 23.

¹⁰ See Amstrup March 2019 Letter at 24.

¹¹ See Amstrup March 2019 Letter at 24.

¹² See Amstrup March 2019 Letter at 14 (finding that if there were 15 undetected dens in the survey area, on average 13 would be within distance from vehicle passage known to cause premature den opening in the past); *id.* at 2, and Table 2 (showing that on average 14 of 15 undetected dens would be within that disturbance zone taking into account more realistic vehicle paths).

consequences for the cubs.¹³ And such a survey would have a substantial probability of resulting in immediately fatal consequences from undetected dens being directly run over by heavy vehicles, killing the cubs and mother.¹⁴

Taking into account the realities of vehicle movement during recent seismic surveys, Dr. Amstrup estimates that if there are as few as 10 undetected dens within the outer bounds of the area where the seismic survey takes place, there is a 79% probability that at least one of those dens would be directly run over.¹⁵ Even if there are only 5 undetected dens in the area where the seismic survey takes place, there would be a 54% probability that at least one of those dens would be directly run over.¹⁶ And even if there are only 2 undetected dens in the seismic survey area, the probability of directly running at least one of them over would be 27%.¹⁷ Dr. Amstrup also estimates that if there are as few as 2 undetected dens in the seismic survey area, there is a 99% probability that at least one of them would be close enough to vehicles to cause the mother to prematurely open her den, creating a risk of latent death to the cubs resulting from leaving the den sooner than they would have without disturbance.¹⁸ As Dr. Amstrup describes, these losses would have a population-level impact on the Southern Beaufort Sea polar bear population by exacerbating its current decline.¹⁹

The conclusions in the DEIS expressly rely on the faulty assumption that den detection methods will be effective.²⁰ Consequently, BLM's failure to address that den detections methods will fail to find at least half of the dens in the surveyed area vitiates its conclusions. As a result of this failure, the DEIS violates NEPA by misleadingly concluding that den detection surveys will reduce harm to negligible levels, and thereby obscuring the true extent of harm.

B. The DEIS Fails to Take a Hard Look at the Impacts of Seismic Exploration

During the scoping process for the DEIS, BLM asserted that the EIS here “will serve to inform BLM’s implementation of the Tax Act, including the requirement to hold...lease sales” and “may also inform post-lease activities, including seismic and drilling exploration” and “will consider and analyze the potential environmental impacts of various leasing alternatives, including ... the terms and conditions (i.e., lease stipulations and best management practices) to

¹³ See Amstrup March 2019 Letter at 14–16, 18–19, Table 2.

¹⁴ See Amstrup March 2019 Letter at 16, Table 2.

¹⁵ See Amstrup March 2019 Letter at 2, 16, Table 2 (columns 1 and 2).

¹⁶ See Amstrup March 2019 Letter at Table 2 (columns 1 and 2).

¹⁷ See Amstrup March 2019 Letter at Table 2 (columns 1 and 2).

¹⁸ See Amstrup March 2019 Letter at Table 2 (columns 1 and 4); *id.* at 14–15, 18–19 (describing potential lethal latent consequences from dens being within 65 meters of vehicles). Even assuming vehicles actually followed only a single path across each grid line, it would still be the case that if there are as few as 4 undetected dens in the surveyed area, the probability of at least one being within 65 meters of the vehicle tracks would come close to 100%). *Id.* at 18–19, Table 1.

¹⁹ See Amstrup March 2019 Letter at 15, 25, 41.

²⁰ See, e.g., DEIS at 3-137, 3-138, 3-141.

be applied to leases *and associated oil and gas activities* to properly balance oil and gas development with existing uses and conservation of surface resources.”²¹ The alternatives presented in the DEIS include specific required operating procedures (ROPs) addressing seismic surveys.²² The DEIS also contains lease stipulations that would ostensibly apply to seismic surveys conducted by lessees, such as keeping all oil and gas “activities” out of specified geographic areas during certain times of the year.²³ Despite the plain fact that this DEIS is making decisions regarding the requirements to apply to seismic exploration, it fails to engage in analysis adequate to inform those decisions.

As described above, the DEIS provides a cursory analysis of the impacts of seismic exploration that consists largely of acknowledging the activity can cause serious harm, but then (erroneously and conclusorily) assuming that the harm will be reduced to negligible levels by the application of den detection surveys and avoidance of dens identified by den detection surveys. One key consequence of this error is that the DEIS fails to include any consideration of the extent to which imposing additional requirements on the methods used in den detection surveys could improve upon the 50% failure rate associated with FLIR surveys. Nor does the DEIS examine whether there are limitations on the extent to which the failure rate could be improved through such requirements as a practical matter. Another key consequence of the failure to take a hard look at impacts is that BLM does not evaluate the need to impose restraints on the spatial extent of seismic surveys that can occur during a single denning season.

In the attached analysis, Dr. Amstrup shows quantitatively how a Coastal Plain-wide 3D seismic survey like the one proposed to BLM in 2018 would cause potentially lethal consequences to numerous denning polar bears and cubs because of the at least 50% failure to detect rate associated with den detection methods, the tight density of the seismic survey grid (which defines the area that will be traversed by heavy vehicles), the distance of heavy vehicle passage known to cause serious disturbance to denning polar bears, and the number of dens likely to be distributed in the Coastal Plain during a given denning season. Using information presented in the DEIS and other data, Dr. Amstrup estimates that there now may be between 20 and 29 dens in the Coastal Plain during a given denning season, and that at least half (i.e., 10 to 15 dens) would be undetected by FLIR surveys.²⁴ Dr. Amstrup’s analysis demonstrates a seismic survey grid density like the one proposed to BLM by SAExploration in 2018 would place 88% to 92% of the land surface in the survey area within 65 meters of heavy vehicle passage, a proximity that has caused premature den emergence in the past.²⁵ When that grid extends across

²¹ 83 Fed. Reg. 17,562 (Apr. 20, 2018) (emphasis added).

²² See DEIS vol. 1 at 2-20.

²³ See DEIS vol. 1 at 2-10.

²⁴ Amstrup March 2019 Letter at 11–12, 13, 40.

²⁵ See Amstrup March 2019 Letter at 13–16. Notably, dens farther than 65 meters from heavy vehicles cannot be assumed safe from disturbance. See *id.* at 17, n.7. Indeed, FWS has applied an avoidance buffer of 1 mile with the intent of ensuring safety from disturbance. But vehicle passage at 65 meters from the den was documented as causing a mother polar bear to open her den prematurely during a field encounter. See *id.* at 5. Therefore, the analysis uses 65 meters as a distance known to cause den opening, and therefore create serious risk of premature den abandonment and other potentially lethal consequences.

the entire Coastal Plain, on average 13 to 14 of 15 undetected dens would be within 65 meters of heavy vehicles, and therefore be at risk for, inter alia, latent lethal effects to the cubs resulting from the mother leaving the den or taking them from the den sooner than she otherwise would.²⁶ Every day of nursing in the den is vital to cubs being nourished enough to survive.²⁷ Moreover, such a seismic survey would on average result in up to 2 of 15 undetected dens being directly run over by heavy vehicles, with potential immediately fatal consequences for the mother and cubs, when the realities of vehicle path width are taken into account, and there would be a 90% probability of at least one den being run over under those circumstances.²⁸ Even if there were only 10 undetected dens dispersed in the seismic survey area, there would be a 79% probability of at least one den being directly run over when the realities of vehicle path width are taken into account.²⁹

The risk of a seismic survey causing immediate and latent lethal consequences is still substantial even if the seismic survey area is smaller and encompasses fewer undetected den locations. For example, if there are only 5 undetected dens in the area where the seismic survey takes place, there would be a 54% probability that at least one of those dens would be directly run over.³⁰ And even if there are only 2 undetected dens in the seismic survey area, the probability of directly running at least one of them over would be 27%.³¹ Dr. Amstrup also estimates that if there are as few as 2 undetected dens in the seismic survey area, there is a 99% probability that at least one of them would be close enough to vehicles to cause the mother to prematurely open her den, creating a risk of latent death to the cubs resulting from leaving the den sooner than they would have without disturbance.³²

As stated above, based on the footprint of the seismic survey grid, if there is one den somewhere within the bounds of the seismic survey area, the risk of that individual undetected den being within 65 meters of heavy vehicle passage is between 88% and 92%.³³ Reducing the level of risk would require reducing the areal extent covered by the outer bounds of the survey grid during a given denning season to encompass an area where less than 1 undetected den would

²⁶ See Amstrup March 2019 Letter at 14 (finding that if there were 15 undetected dens in the survey area, on average 13 would be within distance from vehicle passage known to cause premature den opening in the past); *id.* at 2, and Table 2 (showing that on average 14 of 15 undetected dens would be within that disturbance zone taking into account more realistic vehicle paths).

²⁷ See Amstrup March 2019 Letter at 7, 14–15.

²⁸ See Amstrup March 2019 Letter at 2, 16, Table 2.

²⁹ See Amstrup March 2019 Letter at 2, 16, Table 2 (columns 1 and 2).

³⁰ See Amstrup March 2019 Letter at Table 2 (columns 1 and 2).

³¹ See Amstrup March 2019 Letter at Table 2 (columns 1 and 2).

³² See Amstrup March 2019 Letter at Table 2 (columns 1 and 4); *id.* at 14–15, 18–19 (describing potential lethal latent consequences from dens being within 65 meters of vehicles). Even assuming vehicles actually followed only a single path across each grid line, it would still be the case that if there are as few as 4 undetected dens in the surveyed area, the probability of at least one being within 65 meters of the vehicle tracks would come close to 100%). *Id.* at 18–19, Table

1.

³³ See Amstrup March 2019 Letter at 13–16.

be expected to be present. For example, if there were 10 undetected dens dispersed evenly across the Coastal Plain, a hypothetical seismic survey with outer bounds encompassing 1/10th of the Coastal Plain's area would likely encompass 1 undetected den, and have an 88 to 92% probability of that undetected den being within 65 meters of heavy vehicles. Limiting the extent of the hypothetical seismic survey so that its outer bounds encompass 1/20th of the Coastal Plain, by halving the area of the seismic survey, would reduce that probability to 44 to 46%, by making it likely that only 0.5 undetected dens would be within those bounds instead of 1 undetected den.

Thus, reducing the risk of vehicles being within 65 meters of an undetected den to low levels, and therefore reducing the risk of potential lethal latent consequences for the cubs resulting from disturbance, would require limiting the areal extent of seismic surveys to only a very small proportion of the Coastal Plain during a given season. The DEIS provides no such analysis to evaluate the risks of seismic surveys, or to analyze how the risks will vary depending on the areal extent of the survey's bounds during a given season. It ignores this important consideration.

Similarly, the DEIS fails to provide any analysis of the risk of immediately fatal encounters occurring when undetected dens are directly run over. For example, as Dr. Amstrup's analysis shows, if there are as few as 5 undetected dens within the outer bounds of a seismic survey area during a given denning season, the probability of at least one undetected den being directly run over by vehicles would be 54%.³⁴ Again, reducing this probability to much lower levels would require limiting the extent of the area that can be surveyed in a given season.

Instead, the DEIS with little to no explanation presents one alternative that would exclude seismic surveys within 1 mile of "potential denning habitat" from a very small section of the Coastal Plain (105,400 acres) during the polar bear denning season (see Alternative D-Lease Stipulation 5),³⁵ an area which encompasses only 8.8% of the polar bear critical habitat for terrestrial denning.³⁶ The only apparent rationale that can be gleaned from the DEIS for conferring protection on that small portion of the habitat is that 37% of *known historic* dens in the Coastal Plain have been observed there.³⁷ The implication in the DEIS is that the density of polar bear dens in that 105,400 acres of the Coastal Plain is higher than in the rest of the Coastal Plain. The DEIS provides no analysis or evaluation of the legitimacy of this important assumption. It does not evaluate whether the apparent density may be the result of survey biases from observations being made more frequently in areas that are most physically accessible to researchers, or more frequently accessed by researchers. It does not evaluate whether telemetry biases may be implicated, nor explain whether any effort has been made to account for such factors. It does not evaluate whether historic observations need to be distinguished from more contemporary ones, and from projections about future locations, due to shifts in habitat use resulting from climate change, though changes in snow distribution and coastal erosion

³⁴ See Amstrup March 2019 Letter at Table 2, columns 1 and 2.

³⁵ DEIS at 2-10.

³⁶ Designated critical habitat covers 77% of the Coastal Plain. The entire Coastal Plain is approximately 1,563,500 acres. Seventy-seven percent of that is 1,203,895 acres. 105,400 acres/1,203,895 acres = 8.75%.

³⁷ See DEIS at 3-147.

demonstrate there is good reason to do so.³⁸ In short, it appears that BLM has made a vitally important decision about what habitat to protect, ostensibly based on conclusions that the environmental impact in that area would be more dire than in the rest of the Coastal Plain, without providing any analysis in the DEIS to explain its assessment of that impact, its many underlying assumptions, or how it evaluated those assumptions. This failure to explain its assessment of impacts is in itself a violation of NEPA requirements.

Moreover, even if BLM could rationally support a conclusion that 37% of den sites are located within just 105,400 acres of the Coastal Plain, which is seemingly the most extreme conclusion they could reach from the data they present, that would not obviate the need to impose significant constraints on the areal extent of the seismic surveys to be conducted in the rest of the Coastal Plain.³⁹ If, as Dr. Amstrup estimates, there are 20–29 dens in the Coastal Plain each year, that would still mean that roughly 13 to 18 dens (i.e. 63% of 20 and 29) would be located in the section of the Coastal Plain not subject to the protections of Alternative D-Lease Stipulation 5. Again, per Dr. Amstrup’s estimates, at least half of those 13 to 18 dens would remain undetected despite FLIR surveys, such that approximately 6 to 9 undetected dens would be present across the portion of the Coastal Plain outside of Alternative D-Lease Stipulation 5. A 3D seismic survey across that area would therefore still expose 6 to 9 dens each to at least an 88% probability of being within 65 meters of heavy vehicle passage. If there are as few as 6 undetected dens within the outer bounds of a seismic survey area during a given denning season, the probability of at least one undetected den being directly run over by vehicles would be 61%.⁴⁰ And even if there are as few as 2 undetected dens within the bounds of the seismic survey, there would be a 99% probability that at least one of them would be within 65 meters of heavy vehicles, with potential latent lethal consequences.⁴¹ And again, reducing the probability of any undetected den being within 65 meters of heavy vehicle to a low level would require reducing the areal extent covered by the outer bounds of the seismic survey during a given denning season to only a very small portion of the Coastal Plain. Using the estimate in the DEIS of 19 maternal polar bear dens in the Coastal Plain does not change this conclusion, as there would still be approximately 6 undetected dens in the area not protected by Alternative D-Lease Stipulation 5,⁴² and Dr. Amstrup’s analysis shows the probability of at least one of those dens being directly run over would be 61%.⁴³ This makes clear that, in addition to exposing cubs

³⁸ See Amstrup March 2019 Letter at 26 (“...as human-caused climate change continues, the distribution of snow will be changing, and coastal erosion will alter some currently desirable locations. Sections of suitable den habitat that have been preferred for maternal denning in the past may become less preferred and other less used areas of suitable habitat may become more preferred. ...Therefore, BLM should protect all identified habitat to assure polar bears face the fewest restrictions possible in giving birth to their cubs.”).

³⁹ See also Amstrup March 2019 Letter at 25–28 (explaining reasons why it is important to protect the area encompassing the other 63% of historically identified den locations).

⁴⁰ See Amstrup March 2019 Letter at Table 2, columns 1 and 2.

⁴¹ See Amstrup March 2019 Letter at Table 2, columns 1 and 4.

⁴² Assuming there are 19 maternal dens, at least 63% would be located outside the area protected by Alternative D-Lease Stipulation 5, which would be 12 dens. And at least 50% of those dens would remain undetected despite FLIR surveys, leaving at least 6 dens vulnerable to harm.

⁴³ See Amstrup March 2019 Letter at Table 2, columns 1 and 2.

in multiple dens to latent lethal consequences from disturbance, there is a substantial probability of a mother and her cubs being immediately killed or severely injured from a seismic survey, even if the spatial restrictions of Alternative D-Lease Stipulation 5 are fully enforced. Yet the DEIS totally fails to evaluate what the impacts on polar bears will be from allowing seismic surveys to move forward in the vast area not protected by that stipulation.

Given that SAExploration submitted an application to BLM prior to July 2018 to conduct a Coastal Plain wide 3D seismic survey, which BLM made public in July 2018, and that in August of 2018 Sierra Club submitted to BLM an evaluation by Dr. Amstrup of that proposal, identifying the high failure rate for FLIR survey den-detection methods, as well as the reasons why the failure rate was likely to be even worse in the Coastal Plain, and providing a quantitative statistical analysis showing substantial risk of lethal impacts and population-level effects, BLM's failure to analyze the impacts of potential seismic surveys in light of the concrete plans pending before it is astonishing, and seems to reflect an intentional decision to avoid exposing its analysis of impacts to public scrutiny, in violation of NEPA's requirements that the agency take a hard look at impacts and disclose the resulting analysis to the public for comment.

C. The DEIS Improperly Relies on Future Decisions by Other Agencies to Conclude Impacts to Polar Bears Will Not Be Significant Due to Mitigation

The DEIS repeatedly relies on the assertion that Incidental Take Regulations (ITRs) covering other locations have successfully minimized impacts on polar bears from oil and gas activities to conclude that future ITRs for the Coastal Plain therefore will ensure that impacts to polar bears from the program activities on the Coastal Plain will be "low."⁴⁴ This assertion is faulty and BLM's substitution of these assertions for analysis of impacts violates NEPA for several distinct and independent reasons.

First, BLM cannot abdicate its responsibility under NEPA for assessing the impacts that the program will have on polar bears by deferring the actual analysis of impacts to future decision-making by another agency. *See, e.g., Idaho v. ICC*, 35 F.3d 585 (D.C. Cir. 1994); *Calvert Cliffs' Coordinating Comm. v. Atomic Energy Comm'n*, 449 F.2d 1109 (D.C. Cir. 1971). In this DEIS, BLM is not merely mentioning that other agencies will regulate the impacts in question, it is relying on those future processes as a substitute for its own evaluation of whether the mitigation measures that have been applied in the past, in areas distinct from the Coastal

⁴⁴ *See e.g.,* DEIS vol. 1 at 3-144, (stating that the current ITR process has been effective at addressing and mitigating the risks from human encounters with polar bears); *id.* at 3-141 ("The precautions against den disturbance in the interaction plan, required under ITRs, and the denning surveys conducted before seismic exploration and construction of roads and pads would minimize the likelihood of this potential risk"; *id.* at 3-138 ("Behavioral disturbance on the productivity of polar bears in the program area is likely to be low. This assumes that all mitigative measures are implemented, as required under ITRs and specified in typical wildlife interaction plans for industrial activity in Arctic Alaska, and that preconstruction den surveys detect most maternal dens in the affected areas.")).

Plain, can be expected to be effective in the Coastal Plain, given differences from those regions, and ongoing environmental changes due to climate change. And BLM is not merely mentioning the ITRs in passing, it is expressly relying on them to tell the public that the impacts to polar bears will not be significant. BLM cannot avoid taking a hard look at the truth of that assertion by assuming that the Fish and Wildlife Service will develop adequate ITRs for the Coastal Plain in the future.

Second, the standard for issuing an ITR under the Marine Mammal Protection Act is that the impact on the stock (here the Southern Beaufort Sea polar bear population) will be “negligible” and affect only “small numbers.” 16 U.S.C. § 1371(a)(5)(A)(i). But a negligible impact on the entirety of the Southern Beaufort Sea population does not necessarily amount to an insignificant impact on the polar bears inhabiting the Refuge, nor does it necessarily amount to a less than significant impact on the values of the Refuge.⁴⁵ Moreover, FWS has interpreted “small numbers” to mean a small proportion *of the whole stock*, not a small absolute number of animals.⁴⁶ Thus the limits of an ITR, as the government has interpreted those limits, do not necessarily comport with an assurance that the subset of the Southern Beaufort Sea population utilizing the Refuge will not suffer significant impacts, nor that the value of the Refuge for preserving polar bears “in their natural diversity” among other species will not be significantly affected. In relying on the ITRs, BLM is improperly ignoring the need to take a hard look at whether impairing the usage of the Refuge by polar bears, and the presence of polar bears in the Refuge, is a significant impact to the values and purposes of the Refuge apart from impacts to the whole Southern Beaufort Sea stock.

Third, the DEIS fails to consider that past ITRs for other regions were not necessarily effective, as well as to consider whether geographic differences and changing environmental conditions cast doubt on the presumption that past effectiveness can be relied upon to conclude future ITRs also will be effective. As detailed above, the den-detection methods relied upon by past ITRs likely missed at least half of maternal dens. And, as Dr. Amstrup explains, lethal consequences from disturbances of undetected dens likely would remain undocumented as a

⁴⁵ Notably, nothing in the DEIS supports a conclusion that FWS could actually rationally and lawfully find that the impacts of oil and gas activities will be negligible in light of the catastrophically declining status of the Southern Beaufort Sea population, the density and number of bears denning in the Coastal Plain, the greater difficulty of using den-detection methods due to the habitat complexity, the higher presence of polar bears in the Coastal Plain compared to other onshore areas, and the ongoing effects of climate change. Nor does the information in the DEIS support a conclusion that FWS could rationally and lawfully conclude that only “small numbers” will be affected by the proposed activities taking place in the Coastal Plain. It is only by ignoring the differences between the Coastal Plain and other areas, and glossing over the realities of climate change now and during the time when program activities will be occurring that the DEIS assumes that impacts will be negligible and affect only small numbers.

⁴⁶ See, e.g., *Ctr. for Biological Diversity v. Salazar*, 695 F.3d 893, 907 (9th Cir. 2012) (discussing FWS conclusion that only small numbers would be affected where “the number of animals coming in contact with the industry activity will be small by an order of magnitude to the [relevant walrus and] polar bear populations.”).

practical matter.⁴⁷ Nonetheless, what has been documented is that post-birth cub loss of recent years is more than double that of the past.⁴⁸ While population declines for the Southern Beaufort Sea polar bears have been driven by climate change, Dr. Amstrup explains that “we cannot overlook the hypothesis that the expanding human footprint in and near polar bear habitat also may have played a role in contributing to the recent declining trend in Southern Beaufort Sea polar bear numbers. Population declines since the late 1990s, have coincided with major expansion of oil exploration and development activities[.]”⁴⁹

Further, as Dr. Amstrup explains, habitat complexity and density of maternal dens on the Arctic Refuge Coastal Plain are far greater than other parts of Arctic Alaska where oil and gas exploration and development have occurred under past ITRs.⁵⁰ As discussed above in detail, those distinctions make it more likely that den-detection methods will fail, and that the consequences of such failure will be of a greater magnitude.⁵¹ Moreover, in light of post-birth cub loss now being more than double that of the past, the additional impact of unobserved latent impacts from disturbances would be more dire now than in the past. And bear/human interactions in the existing oilfields have been increasing in recent years as more bears are spending more time on land.⁵² As numbers of free-ranging polar bears historically have been higher in the Arctic Refuge area than other parts of Alaska’s Arctic where oil and gas activities have occurred, these increasing interactions are even more of a concern for the Coastal Plain than for those other areas.⁵³ As Dr. Amstrup explains, fatal interactions are likely to increase, and the consequences of the resulting losses are more dire now than in the past given the declining status of the SBS population.⁵⁴ Further, due to stresses caused by climate change, interactions that in the past may have resulted only in annoyance to maternal bears, such as disturbance leading to a den relocation prior to birthing, could now result in serious harm due to bears being less nourished than in the past.⁵⁵ BLM has failed to consider these distinctions. BLM’s assertion to the public that mitigation measures like those imposed by past ITRs will reduce impacts of the proposed alternatives to “low,” non-significant levels therefore is arbitrary and capricious, misleading, and a failure to take the hard look at impacts required by NEPA.

⁴⁷ Amstrup March 2019 Letter at 29.

⁴⁸ Amstrup March 2019 Letter at 29.

⁴⁹ Amstrup March 2019 Letter at 39.

⁵⁰ Amstrup March 2019 Letter at 29–30.

⁵¹ See also Amstrup March 2019 Letter at 23 (explaining why FLIR surveys are likely to have an even higher rate of detection failure in the Coastal Plain); *id.* at 30 (“Because previously implemented ‘safeguards’ have been at most marginally effective elsewhere, we can be confident they will be less effective on the more complicated habitat of the Arctic Refuge Coastal Plain.”).

⁵² Amstrup March 2019 Letter at 30.

⁵³ Amstrup March 2019 Letter at 32.

⁵⁴ Amstrup March 2019 Letter at 32.

⁵⁵ Amstrup March 2019 Letter at 34–35.

D. The DEIS Fails to Take a Hard Look at How Ongoing Climate Change Undermines Its Conclusions

The DEIS totally fails to reconcile its reliance on past mitigation measures and observations with its acknowledgment that climate change is disastrously altering conditions for the Southern Beaufort Sea (SBS) polar bears. In its description of the “Affected Environment,” the DEIS describes a number of ways in which climate change has altered the behavior, condition, and status of Southern Beaufort Sea polar bears.⁵⁶ Problematically, the DEIS does not meaningfully apply that information to provide the public with an assessment of the magnitude and severity of the impacts of the proposed program on polar bears experiencing these disastrous effects. The discussion of impacts, considered in light of climate change, is limited to brief glosses that fail to provide any indication of the total anticipated impact on the species, SBS stock, or continued presence of polar bears in the Refuge. Worse, the DEIS does not reconcile its conclusions that harm will not be significant with the facts it acknowledges about the present and future conditions resulting from climate change, and how they differ from past conditions.

The analysis of impacts begins with a boiler plate sentence repeated throughout the DEIS: “The effects of climate change... could influence the rate or degree of the potential direct and indirect impacts.”⁵⁷ In discussing the impacts of the proposal in terms of habitat loss, disturbance and displacement, and injury or mortality, the DEIS asserts conclusions that impacts will be “minimal,”⁵⁸ “negligible,”⁵⁹ “low,”⁶⁰ “minimized,”⁶¹ and “negligible” at the population level by relying on mitigation measures that purportedly have sufficiently reduced impacts in the past, in other areas.⁶² After making these conclusions, the DEIS notes that climate change could increase the impact, but the DEIS makes no effort whatsoever to explain to the public whether the resultant impact will still be “minimal,” “negligible,” or “low.”⁶³ In violation of NEPA, this

⁵⁶ DEIS vol. 1 at 3-132.

⁵⁷ DEIS vol.1 at 3-133.

⁵⁸ DEIS vol. 1 at 3-135 (“overall the effects of reduced use of habitats near oil and gas facilities likely would be minimal, although they would be long term.”).

⁵⁹ DEIS vol. 1 at 3-138 (“The potential effects of short-term behavioral disturbance are likely to be negligible on the SBS population...”).

⁶⁰ DEIS vol. 1 at 3-138 (“Behavioral disturbance on the productivity of polar bears in the program area is likely to be low. This assumes that all mitigative measures are implemented, as required under ITRs and specified in typical wildlife interaction plans for industrial activity in Arctic Alaska, and that preconstruction den surveys detect most maternal dens in the affected areas.”).

⁶¹ DEIS vol. 1 at 3-141 (“The precautions against den disturbance in the interaction plan, required under ITRs, and the denning surveys conducted before seismic exploration and construction of roads and pads would minimize the likelihood of this potential risk.”).

⁶² DEIS vol. 1 at 3-142 (With mitigation in place, the net effects of program-related activities are likely to be negligible in terms of injury and mortality at the population level.”).

⁶³ See DEIS vol. 1 at 3-138 (“The potential effects of short-term behavioral disturbance are likely to be negligible on the SBS population, *although the magnitude may increase in the future* with increasing terrestrial presence of bears in late summer and autumn. Polar bears spending more time on land and fasting more as sea-ice cover diminishes are likely to experience an

approach completely obscures the true impacts and impermissibly dodges the question of how severe the impacts of this program will be given the actual conditions that polar bears will be experiencing when program activities are occurring.

With regard to injury and mortality, the DEIS concludes that mitigation measures in the past have been effective to reduce fatalities to levels that are not significant, and that therefore the net effects on the SBS population from the proposal will be negligible.⁶⁴ The DEIS makes no attempt whatsoever to reconcile this conclusion with its statement, in the preceding paragraph, that “Any injury or mortality from oil and gas development-related human-bear conflicts would *pose a problem* because of the declining status of the SBS population.”⁶⁵ Indeed, the reality is that fatalities have occurred in the past, that potentially fatal interactions are more likely now than in the past due to climate change, and will likely be increasingly more frequent during the timeframe for the proposed program activities.

Moreover, interactions and disturbances of bears that in the past may have had only a minor impact on the individual bear now and in the future are increasingly more likely to be injurious or fatal due to the compromised condition of the bears. The DEIS concludes that the impacts of disturbing polar bears will be “low” and does not attempt to reconcile that conclusion with statements *in the same paragraph* conceding that:

- “The number of bears potentially affected is likely to increase during the operational life of program-related development as summer sea-ice cover continues to diminish in the future. This could result in more bears being present onshore during the open-water period, traveling the coastline more in summer and fall, and denning onshore. Such an increase is expected ...”
- “It is likely that maternal denning would continue to increase in terrestrial habitats in the future, although the presence of operating facilities would probably discourage female bears from denning in suitable habitat nearby; instead, they would be more likely to seek suitable den sites in less-disturbed areas.”⁶⁶

increase in negative effects on energy budgets as a result of reduced access to fat-rich prey.”) (emphasis added); *id.* (Behavioral disturbance on the productivity of polar bears in the program area is likely to be low.... The number of bears potentially affected is likely to increase during the operational life of program-related development as summer sea-ice cover continues to diminish in the future. This could result in more bears being present onshore during the open-water period, traveling the coastline more in summer and fall, and denning onshore. Such an increase is expected ... It is likely that maternal denning would continue to increase in terrestrial habitats in the future, although the presence of operating facilities would probably discourage female bears from denning in suitable habitat nearby; instead, they would be more likely to seek suitable den sites in less-disturbed areas.”); *id.* at 3-140 (“As sea-ice cover continues to diminish, the number of encounters between humans and nutritionally stressed bears is expected to increase.”).

⁶⁴ DEIS vol. 1 at 3-142 (With mitigation in place, the net effects of program-related activities are likely to be negligible in terms of injury and mortality...”).
at the population level..

⁶⁵ DEIS vol. 1 at 3-142 (emphasis added).

⁶⁶ DEIS vol. 1 at 3-138.

Despite acknowledging that the number of bears on land will continue to increase, that denning on land will increase, that denning polar bears will be deterred from denning in locations affected by oil and gas facilities, and that the bears are more likely to be in poorer condition and nutritionally-stressed than in the past,⁶⁷ the DEIS does not explain whether or how the impacts can nonetheless be described as “low” once these factors have been accounted for. Again, the DEIS presents a conclusion, then notes facts that run contrary to its conclusion, but then fails to reconcile those facts with its conclusion that impacts will be low.

As Dr. Amstrup explains, due to climate change, the numbers of polar bears on land and visiting the bone pile at Kaktovik are almost certain to increase as sea ice continues to decline; numbers of maternal polar bears attempting to den in the Refuge are likely to increase and their importance to population welfare will continue to grow at the same time activities proposed in the DEIS will increasingly impact them; and negative polar bear/human interactions are sure to increase in number.⁶⁸ When the SBS population was thriving, the residual deaths from failures to detect dens or from human/bear interactions may not have had a significant population level impact, but with the population declining due to climate change, it is irrational to assume that those residual deaths are still insignificant.⁶⁹ Indeed, the DEIS itself states that “*any* injury or mortality...would pose a problem” due to the already declining status of the SBS population,⁷⁰ but fails to reconcile that statement with its conclusions that impacts of the program are “low” or “negligible.”

In concluding that bear/human interactions will not have a significant effect on polar bears, the DEIS does not contend with the increase in such interactions that will be driven by climate change causing more polar bears to seek food sources on or near land, and therefore the increase in encounters lethal to polar bears, nor does it deal with the reality that the number of lethal encounters must be considered against a dwindling population, not a thriving or even stable one.⁷¹

Moreover, there will likely be more residual fatalities because climate change will not only increase the frequency of conflicts, but will make the consequences of encounters with people and facilities more likely to be fatal due to the greater impact of increased energy expenditures on bears that are less nourished and in poorer body condition.⁷² For example, the DEIS suggests that maternal females that are disturbed by oil and gas activities or noise from structures between October and November will just relocate to a location without disturbance.⁷³ As Dr. Amstrup explains, while the impacts of such a disturbance *in the past* may not have

⁶⁷ See e.g., DEIS vol. 1 at 3-131-132, 3-140.

⁶⁸ See Amstrup March 2019 Letter at 42.

⁶⁹ See Amstrup March 2019 Letter at 42.

⁷⁰ DEIS vol. 1 at 3-142.

⁷¹ See Amstrup March 2019 Letter at 30–32, 42.

⁷² See Amstrup March 2019 Letter at 42.

⁷³ See DEIS vol. 1 at 3-136 (citing Amstrup) and 3-138 (stating that females will avoid operating facilities by going elsewhere to den).

appeared significant, that conclusion does not hold true for nutritionally stressed polar bears today suffering from the impacts of climate change:

With more female bears already energetically compromised, autumn relocations stimulating pregnant females to relocate and seek alternative den sites could impose an added and significant energetic cost on the mother bear that could have a latent effect on her survival or the survival of her cubs. Under ideal circumstances, there might be minimal impact on females forced to relocate den sites. However, these are not ideal circumstances. Even if it was true in the past that autumn relocation to an alternate den site merely caused annoyance, it is more likely now that serious harm could result from the increased effort to find an alternative den location. Females are already having increased difficulty providing sufficient provisions for their young, and any unnecessary energy drain can only exacerbate ongoing declines in maternal welfare and cub survival.⁷⁴

Further, in reaching the conclusion that disturbed pregnant bears will just relocate to another denning location, the DEIS fails to take into account its own admission that climate change may reduce the availability of stable denning locations due to changes in snow cover early in the denning season.⁷⁵ And such changes to snow cover are indeed expected to occur in the region.⁷⁶

The cursory “cumulative effects” analysis in the DEIS also fails to gauge the magnitude and severity of the proposal’s cumulative impacts with other oil and gas development considering the facts of climate change. The “analysis” offers the perfunctory statement that the “effects of climate change... could influence the rate or degree of the potential cumulative impacts.”⁷⁷

In sum, the DEIS fails to take a hard look at the impacts of the proposal in light of the present and future realities of climate change, reaches conclusions that are not rationally reconciled with the facts it presents, and misrepresents, obscures, or fails to address the actual magnitude and severity of the impacts of the action alternatives, in violation of NEPA.

Moreover, in addition to failing to evaluate the impacts of on the ground development and activities under the program on polar bears in light of the realities of climate change, the

⁷⁴ Amstrup March 2019 Letter at 35.

⁷⁵ DEIS vol. 1 at 3-132 (“The warming temperatures and increased precipitation year-round and longer growing seasons that are predicted to occur in the future may have negative implications for the stable conditions required for maternal denning by polar bears, especially if warm temperatures prevent snow cover of sufficient depth from accumulating early in the denning season.”)

⁷⁶ See NOAA, Final Rule, Threatened Status for Arctic ringed seal (and other subspecies), 77 Fed.Reg. 76706 (December 28, 2012); *see also* Rettig, “Need a Weather Forecast for 2030? Alaska climatologist can help” (May 31, 2016) *available at* <https://www.adn.com/science/article/need-weather-forecast-2030-cutting-edge-alaska-climatologist-may-be-able-helo/2013/05/11/>.

⁷⁷ DEIS vol. 1 at 3-149.

DEIS also fails to examine how the direct and indirect greenhouse gas emissions contributed by combustion and leakage of oil and gas from the Coastal Plain leasing program will affect polar bears by exacerbating or accelerating climate change, or undermining efforts to budget carbon to limit climate change.

E. The DEIS Fails to Take a Hard Look at the Effects of Oil and Gas Related Industrialization in Polar Bear Habitat

The DEIS projects that the Coastal Plain leasing program will result in extensive industrial facilities along the coastline, but fails to analyze the impacts of these coastal facilities either in isolation or cumulatively with other industrialization taking place along the Arctic Coast of Alaska.

In Appendix B, the DEIS describes an extensive industrialization of the Coastal plain as a Reasonably Foreseeable Development (“RFD”) scenario.⁷⁸ It assumes there will be barge landings, staging pads, and a seawater treatment plant located along the coastline. It also assumes road/pipeline connections to at the seawater plant: “A barge landing and an associated staging pad to store equipment and modules until ice roads can be constructed would typically disturb approximately 10 acres, including the barge landing and a gravel staging pad.... A road and seawater transport pipeline would be constructed from the seawater treatment plant to the [Central Processing Facility]. Typical gravel roads in the Arctic require 7.5 acres of surface disturbance per mile.”⁷⁹ In combination with other oil and gas development taking place, the industrialization associated with a Coastal Plain leasing program would mean that essentially half of the Arctic Coast of Alaska is occupied in some form by industrial developments, and the previously pristine coastline pregnant polar bears visit each autumn would be fragmented by human developments.⁸⁰

The DEIS fails to assess how this industrialization will impose potentially disastrous increased energetic costs on polar bears coming onshore to seek den locations. As Dr. Amstrup explains, “Whether a bear moves farther inland in autumn than otherwise would have been the case or is disturbed after den establishment by intensifying winter activities, the extra energy required can only compound the negative energy balance many mother bears in the Southern Beaufort Sea currently experience... Roads and pipeline corridors running parallel to the coast may influence polar bears to deviate from historically preferred pathways to their denning areas. These impacts would not only compromise bears preferring to den on the Arctic Refuge, but also the habitats between Prudhoe Bay and the Refuge. Some of the most frequently used denning habitat in Alaska is found in the coastal area immediately to the west of the Arctic Refuge

⁷⁸ Notably, as explained in our joint comments, the RFD scenario in the DEIS in itself is problematic and fails to adequately characterize the full extent of development that is reasonably foreseeable. Compounding this problem, as explained below, the DEIS fails to evaluate the impacts even of the development that it acknowledges as reasonably foreseeable to occur.

⁷⁹ DEIS Appendix B at B-15-16.

⁸⁰ Amstrup March 2019 Letter at 38.

boundary.”⁸¹ The potential impact of such additional energy losses needs to be analyzed in light of the severely compromised state of bears in the Southern Beaufort Sea population.⁸²

The DEIS does not assess how the extensive critical habitat destruction, alteration, and fragmentation associated with the footprint of facilities described in the RFD will affect polar bears. Instead, it provides tables summarizing the areal overlap of lease areas with polar bear habitat. That overlap does not meaningfully answer the question of what the magnitude or severity of the impacts of the projected development will be either on the SBS stock or the presence of polar bears in the Refuge. After summarizing the extent of overlap for the action alternatives, the DEIS acknowledges that polar bears likely would be disturbed by activities on drill pad sites and roads, with the likelihood of disturbance being highest closest to the coastline.⁸³ In an unexplained logical leap, the DEIS then immediately thereafter concludes that “overall, the effects of reduced use of habitats near oil and gas facilities likely would be minimal, although they would be long term.”⁸⁴ Indeed, it is totally unclear how the DEIS could reach such a conclusion when it has avoided any actual attempt to take the projected development footprint and assess how it would impair polar bear access to denning locations. Moreover, this conclusion fails to take into account the worsened and worsening condition of bears, particularly denning mothers and cubs, the additional energy demands associated with deterrence, avoidance, and impedances in reaching den locations, and the trend toward increased dependence on onshore habitats.

Rather than assess these impacts on polar bear habitat, the DEIS implies that stipulations will mitigate the impacts of development in polar bear habitat. But the DEIS provides no actual analysis to show how development of permanent facilities that could nonetheless still occur under the terms of the stipulations would fragment polar bear habitat by creating obstacles in the corridors between areas of suitable denning habitat. For example, Alternative D- Lease Stipulation 5 would prevent permanent facilities within 1 mile of suitable denning habitat for areas within 5 miles of the coast. Aside from the important fact that this stipulation can be waived by BLM officials, even if fully enforced the stipulation would not bar permanent facilities from areas of critical habitat between the one mile buffer zones surrounding segments of what the DEIS maps as suitable denning habitat. What is totally missing from the DEIS is an analysis of whether development in the areas between and around those buffered segments could affect access to the denning habitats, or movement between segments of suitable denning habitats.

Further, since the stipulation allows it to be waived if “the BLM Authorized Officer approves alternative measures,” and does not in any manner prescribe limits on that approval, a process for that approval, what “alternative measures” may be considered, or limitations on the

⁸¹ Amstrup March 2019 Letter at 37–38.

⁸² Amstrup March 2019 Letter at 39.

⁸³ DEIS vol. 1 at 3-135 (“Most polar bears moving through areas near industrial facilities would likely be disturbed by activities on, or be hazed away from, drill-site pads. Disturbance from traffic on access roads would likely alter the use of habitats by bears nearby, although those effects would diminish for facilities located farther inland because they would be less likely to be used by bears than other areas near the coastline.”).

⁸⁴ DEIS vol. 1 at 3-135.

circumstances under which such an approval may be sought,⁸⁵ BLM cannot rationally rely on it to avoid analyzing the impacts of permanent facilities being developed in and across that portion of the Coastal Plain.

Moreover, this stipulation is only imposed under Alternative D. The other action alternatives for Lease Stipulation 5 stipulate a requirement for compliance with the ESA and MMPA in lieu of actually setting forth protective measures. But BLM cannot satisfy its obligations for analysis under NEPA merely by deferring to future requirements that may or may not be imposed through the actions of other agencies. And consequences that do not cause jeopardy to the whole species or no more than a negligible impact to the whole stock do not necessarily amount to insignificant impacts for the purposes of a NEPA analysis of how polar bears using the Refuge will be affected by the proposed alternatives.

The DEIS asserts that other lease stipulations incidentally provide protections against development or disturbance in polar bear habitat, but again, there is no analysis in the DEIS to explain where the permanent facilities anticipated in the RFD could nonetheless be located under the terms of the stipulations, and what the impacts on polar bears would be in terms of impeding their access to or use of denning habitat, or creating additional energy demands on already stressed bears. Indeed, the DEIS expressly states that exceptions to No Surface Occupancy stipulations would be made for roads, pipelines, barge landings, and docks,⁸⁶ making it plain that those stipulations do not preclude habitat fragmentation and obstruction of access to denning locations for polar bears.

To comply with NEPA, the DEIS should have analyzed the impact of the anticipated facilities in the RFD being constructed along the coastal area of the Coastal Plain on fragmentation of polar bear habitat, and the consequences of that likely footprint of industrial facilities for imposing additional energy demands on already weakened maternal polar bears seeking den locations. The DEIS cannot rationally rely on the proposed stipulations without assessing the impact from development in the areas that the stipulations leave available for the projected development.

The DEIS also fails to meaningfully describe the magnitude and severity of the cumulative impacts of the projected development on polar bears considered with other oil and gas development in polar bear habitat on the Alaskan coast. In the cursory cumulative impacts analysis, the DEIS states that expansion of oil and gas development “may reach a level at which such effects *become problematic* for polar bears in the future.”⁸⁷ Other than conceding that the cumulative effects will be a problem, the DEIS makes no attempt to explain or analyze how severe that problem will be, which is the question that the DEIS is supposed to be addressing. Similarly, with regard to the cumulative impacts of oil and gas production on habitat and denning, the DEIS states that, “The combined effects...may contribute to adverse effects on polar bear... populations in the future.”⁸⁸ But, again, there is no analysis or explanation of how

⁸⁵ DEIS vol. 1 at 2-10.

⁸⁶ DEIS vol. 1 at 3-102.

⁸⁷ DEIS vol. 1 at 3-148 (emphasis added).

⁸⁸ DEIS vol. 1 at 3-149.

significant those adverse effects will be. With regard to increased human/bear interactions, the DEIS states that the program “would have additive cumulative effects on polar bears, possibly resulting in additional impacts on the SBS stock.”⁸⁹ But once again, the DEIS totally fails to explain or analyze what the magnitude or severity of that “additional” impact on the stock will be. The DEIS thus fails to gauge the significance of the cumulative impacts on the species, the SBS stock, and the presence of polar bears in the Refuge. Nor does the DEIS attempt to explain or evaluate how the action alternatives are nonetheless lawful in light of the Secretary’s obligations under the Refuge Act, ANILCA, and the ESA, nor how the development could comply with the Marine Mammal Protection Act.

Given the other industrialization taking place along the Alaskan coast, the loss of sea ice, and the declining condition of the Southern Beaufort Sea bears, the Coastal Plain of the Arctic National Wildlife Refuge is truly a refuge for polar bears, in particular the maternal bears seeking to den on land—a place where, up to this point, they could den in safety. The DEIS thus must also examine the impacts of proposed RFD in the broader context of an industrialized Alaskan coast, and provide an assessment of the magnitude and severity of the full cumulative effect of that projected development on the polar bears.

Conclusion

For the reasons articulated above, the DEIS is legally deficient to meet the requirements of NEPA. The DEIS fails to disclose, and obscures, the agency’s analysis and conclusions rather than making them available for public comment. The DEIS fails to consider whether any of its action alternatives are lawful in light of obligations imposed by other substantive laws, and fails to evaluate any action alternative consistent with those requirements. To satisfy its NEPA obligations, BLM must correct the many deficiencies in the DEIS and offer the public an additional opportunity to comment on a revised draft EIS.

If you have any questions about this submission, please contact me at the phone number or e-mail address below.

Sincerely,



Karimah Schoenhut
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⁸⁹ DEIS vol. 1 at 3-149.

ATTACHMENT 1



March 13, 2019

Coastal Plain Oil and Gas Leasing Program EIS
222 West 7th Avenue, Stop #13
Anchorage, Alaska 99513 -7504
Attn: BLM Project Coordinator Nicole Hayes
blm_ak_coastalplain_EIS@blm.gov
mnhayes@blm.gov

RE: Comments on Draft Coastal Plain Oil and Gas Leasing Program EIS

Dear Project Coordinator Hayes,

On behalf of the Sierra Club, I am writing to submit the attached expert analysis of BLM's Draft Environmental Impact Statement (DEIS) for the Coastal Plain Oil and Gas Leasing Program, prepared by Dr. Steven Amstrup, Chief Scientist for Polar Bears International. Sierra Club retained Dr. Amstrup's expert services through Polar Bears International to provide an assessment of the impact of the proposed oil and gas activities on polar bears, and an evaluation of the DEIS. In addition to comments filed jointly with numerous other environmental organizations, Sierra Club is submitting a separate comment letter, attached, to emphasize certain additional points associated with the impacts to polar bears, and serious deficiencies in the DEIS, that Dr. Amstrup's analysis illuminates.

If you have any questions about this submission, please contact me at the phone number or e-mail address below.

Sincerely,

Karimah Schoenhut
Staff Attorney
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Polar Bears International
P.O. Box 3008
Bozeman, MT 59772

March 8, 2019

Bureau of Land Management
Arctic District Office
222 University Ave
Fairbanks, AK 99709
ea@blm.gov

Dear Sir or Madam:

I am submitting an assessment of the Draft Environmental Impact Statement released by BLM that describes the proposed development of the Arctic National Wildlife Refuge Coastal Plain, a prime denning area for the Southern Beaufort Sea population of polar bears.

To give you some background on my expertise with polar bears, I have devoted almost my entire career to studying them, including 30 years as Polar Bear Project Leader for the U.S. Geological Survey. During that time, I worked with polar bear populations in Alaska, solving basic questions about the bears, including where they den, how far they travel, and how their welfare has changed over the decades. In 2007, I spearheaded the USGS research team that produced the series of nine reports that led the U.S. Secretary of the Interior to list the polar bear as a threatened species.

To date, I have authored or co-authored more than 150 scientific papers on polar bears and research methods, including studies on polar bear den sites, the effectiveness of polar bear den-detection methods, and the health and status of the Southern Beaufort Sea polar bear population.

I am a past chairman of the IUCN Polar Bear Specialist Group and have been an active member of this international group of polar bear experts since 1980.

In 2010, after a 30-year career with the USGS, I became chief scientist for Polar Bears International, a science-based conservation organization whose mission is to conserve polar bears and the sea ice they depend on. As chief scientist, I have remained active in the IUCN Polar Bear Specialist Group and regularly publish scientific papers. In 2012, I was awarded the Indianapolis Prize, the top award for animal conservation.

The analysis that accompanies this letter shows that the risks to an already declining polar bear population are too substantial to allow the project, as described, to proceed and are incompatible with the polar bear's listing as threatened under the Endangered Species Act.

Sincerely,



Steven C. Amstrup, PhD
Chief Scientist
Polar Bears International





Amstrup Evaluation of the DEIS describing proposed development of the Arctic Refuge Coastal Plain

Summary:

The Drafters of the DEIS repeatedly describe how oil and gas exploration and development activities on the Arctic Refuge Coastal Plain will have detrimental effects on polar bears. They point out anticipated impacts from polar bear/human conflict situations will increase in accordance with the most recent literature on this topic (Atwood et al. 2017). They acknowledge that interference with polar bear maternal denning is virtually assured. And, they recognize that these impacts will be magnified by sea ice loss and other ongoing symptoms of global warming. Yet in each case, after explaining why negative effects are virtually certain, the Drafters walk back their assertions by concluding those impacts will be negligible. The Drafters attempt to make a case that existing incidental take regulations combined with new operational restrictions intended to avoid some areas preferred by polar bears (including selected fractions of maternal denning habitat and efforts to detect dens in advance of on-the-ground disturbances) will prevent population-level negative impacts from exploration and development. The Southern Beaufort Sea polar bear population, however, already is in decline due largely to poor survival of cubs (Bromaghin et al 2016) and polar bears

have been granted protection as a threatened species under the U.S. Endangered Species Act. The negative impacts acknowledged in the DEIS are not consistent with conservation in light of the polar bear's threatened status in that the impacts are virtually certain to accelerate the existing population decline. For that reason, they cannot be considered "negligible."

In addition to unconvincing and contradictory arguments about the risks to polar bears from oil and gas development activities, the Drafters largely ignore the potential impact on polar bear maternal dens of exploratory seismic testing that would occur in advance of on-the-ground developments. The Drafters of the DEIS acknowledge that climate change has already reduced this population by approximately half, and a major symptom contributing to that decline is reduced cub survival (Bromaghin et al. 2016). They further admit that 22% of Southern Beaufort Sea polar bears may den annually on the Arctic Refuge Coastal Plain. Yet, the DEIS claims the impacts on denning mother bears and their cubs will be negligible. But what is negligible for a population already in steep decline? As proposed, the 3 dimensional (3D) seismic testing would disturb 88% of maternal denning habitat. If the survey is actually conducted in the fashion of other recent seismic surveys, including multiple paths along grid lines, it would impact 92% or more of identified maternal denning habitats. Such a survey could disturb up to 14 denning mother bears, and it would on average run directly over 2.2 occupied dens with likely fatal consequences for mother bears and cubs. Even assuming the lowest possible estimate of 10 undetected maternal dens, there is a 79% chance one or more dens will be run over, and, on average 1.4 dens would be crushed. Therefore, even with

the lowest probable number of dens occurring on the Arctic Refuge Coastal Plain, the risk of fatal encounters with seismic vehicles is too high to be considered negligible.

The Arctic Refuge Coastal Plain includes the highest density of denning habitat in Alaska. The U.S. Fish and Wildlife Service Conservation Management Plan (U. S. Fish and Wildlife 2016), which was prepared in response to the polar bear's threatened status, concludes that protecting denning habitats is a critical measure for maintaining the maximum possible numbers of polar bears until humans halt greenhouse gas rise and stabilize the sea ice that polar bears require. Because the Arctic Refuge Coastal Plain provides terrestrial denning habitats vital to the survival of the species, it has been designated critical habitat for polar bears of the Southern Beaufort Sea. The importance of polar bear denning habitats on the Arctic Refuge Coastal Plain and the dramatically declining status of this population mean the impacts of exploration and development of oil and gas reserves are not likely to be negligible or in any way compatible with the U.S. Fish and Wildlife Service goal of assuring that polar bear populations are maintained to the maximum extent possible until greenhouse gas rise is halted. Rather, the combined impacts of activities and developments proposed in the DEIS are virtually certain to accelerate the current declining trend of the Southern Beaufort Sea polar bear population.

Major Flaws/Omissions in the DEIS:

Failure to discuss seismic testing—Without giving any detail, the DEIS states “Processed area-wide three-dimensional (3D) seismic data would be available for licensing to all potential bidders at the time of the first lease sale. (Volume 2 B-8).” Such

testing would be used to precisely define drilling sites, other pad locations, and spatial footprints of roads and pipelines. Because no such seismic data currently exist, and would need to be newly acquired, the fact that pre-development seismic exploration is not analyzed in the polar bear section of the DEIS is an egregious omission. Other than stating 3D data would be given to bidders, the DEIS essentially hides the plan for this testing and the impact that testing could have on polar bears. Instead of including it in the DEIS, proposals for the 3D seismic testing on the Coastal Plain need to be acquired from the BLM website as documents separate from the DEIS. The website (<https://eplanning.blm.gov/epl-front-office/eplanning/projectSummary.do?methodName=renderDefaultProjectSummary&projectId=111085>) provides two proposals from SAExploration. Here I evaluate the most recent and most detailed of those proposals¹. While news articles indicate that the exploration proposal may have shifted, these documents remain the most recent public information. If and when new information is released, our comments may be updated. The most recent and most detailed of the two documents (released August 6, 2018) (Marsh Creek Plan of Operations) specifies that the seismic testing will include a 200-meter by 200-meter grid system (specified as ~660 ft), with receiver lines running perpendicular to the source lines. Estimates of the impacts of such an intensive survey follow.

Knowledge of polar bear responses to disturbances near dens—The proposed high-density seismic grid system poses severe risk of disturbance to mother

¹ A seismic proposal with a lower density grid was analyzed previously. Comments here reflect a more precise analysis of the probability that maternal dens will be directly under and/or within 65-meters of heavy equipment pathways.

polar bears and the cubs occupying maternal dens. Published accounts (Amstrup 1993) and other observations affirm that many maternal polar bears will remain in dens despite high levels of activity nearby. Reluctance to abandon a den can be viewed as “tolerance” of disturbances near dens, and bears may hold tight while industrial activities occur nearby. But when the potential disturbance is both intensive and expansive, like 3D seismic testing, that apparent tolerance could have negative consequences. Heavy vehicle traffic and associated activities can cause bears denning within 65-meters of seismic lines to emerge from their dens (Amstrup 1993). On the other hand, tolerance of disturbances near dens is highly variable (Amstrup 1993), and some documented records of close encounters with occupied dens suggest many maternal polar bears are reluctant to leave their dens—despite major disturbances right at den sites.

Three examples of this tolerance illustrate how reluctant some bears can be to abandon dens. 1) In 1984, B.P. Kelly observed a female bear and single cub depart a den after close approach by a large helicopter on 8 March. Kelly entered the den and made some measurements. On 11 March he returned to the den to make more measurements but upon entering the den realized the bears were back. Even after this close encounter these bears remained in the den at least until 13 March (Amstrup 1993), suggesting a great degree of tolerance for disturbance, and attachment to the den. 2) While probing the snow and digging test holes, on April 6, 2001, to locate and measure a previously observed den, S. C. Amstrup suddenly fell through the den roof and realized the den was still occupied. It was not until the roof of the den collapsed and a researcher fell into the den that this mother bear emerged. 3) B. J. Kirschhoffer and R.

Robinson attempted to measure a den they thought had been abandoned, on 29 March 2009, only to find it still occupied. After identifying the location of the den by probing with metal rods, they began digging an access hole. When they penetrated the lair, they realized it was still occupied. They also realized they had parked their snow-mobiles right on top of the den. Despite probing with a metal rod and despite considerable walking around and digging, and despite coming face to face with an intruding researcher, the family remained in the den after the researchers left the area. So, whereas some female bears may emerge from dens as a result of disturbances or activities nearby, others clearly will stay in their dens even through significant disruptions. It is important to emphasize that it is unknown whether or not those bears that stayed in their dens after being exposed disturbances ultimately left their dens sooner than they otherwise would have in the absence of any disturbance.

Both ends of the polar bear's behavior spectrum, with regard to potential disturbances around dens, can result in negative impacts from activities such as 3D seismic testing. Whether from an innate feeling of security in a den or habituation to noises and vibrations of vehicles moving around them; the "comfort level" many polar bears show with activities outside their dens could result in waiting too long to leave a den when the disturbance is truly dangerous for them. The above observations make it clear that some bears will not leave before their den is actually run over and crushed. Even if a mother bear is able to exit her den ahead of oncoming seismic vehicles—in a circumstance where a den is in the direct path of seismic vehicles, her departure threshold might have been exceeded so suddenly as to prompt hurried evacuation

resulting in cubs being left behind and either crushed or abandoned. Other females may be prompted to emerge and even leave dens if an unnatural stimulus is only nearby.

We know that very small cubs cannot survive outside the den (Amstrup and Gardner 1994), and we know early den departure is accompanied by reduced cub survival (Amstrup and Gardner 1994, Rode et al. 2018). Polar bear cubs grow rapidly because they receive extremely rich milk from their mothers (Ramsay and Dunbrack 1986). During years of research in Alaska I noted several very small cubs that survived only short periods after den emergence. These cubs whose mothers emerged from dens very thin and probably not producing adequate milk had more difficulty keeping up with their mother as she moved on the ice to hunt and were clearly more vulnerable than larger cubs. Every additional day in the protection of a den, therefore, can benefit cub survival potential, and a too-early emergence even if cubs appear able to move away with their mother, can reduce post-emergence survival (Amstrup and Gardner 1994, Rode et al. 2018).

How many dens occur on the Coastal Plain each year?

Data source for estimating current and future den numbers—Calculating the expected number of polar bear maternal dens that might occur on the Arctic Refuge Coastal Plain in any one winter depends on estimating the number of female bears in the population, estimating the number of females that may be breeding and entering dens, estimating the number that may be denning on land; and finally estimating the number of land dens that might occur on the Arctic Refuge coastal plain.

The proportion of Southern Beaufort Sea polar bears seeking to den on land has changed as the quantity and quality of sea ice has declined (Amstrup and Gardner

1994, Fischbach et al. 2007, Olsen et al. 2016). Population welfare also has declined with recent reductions in sea ice availability (Amstrup et al. 1986, Regehr et al. 2006, Regehr et al. 2009, Rode et al. 2010, Bromaghin et al. 2016). Therefore, I focus on the locations of dens known by radio-telemetry from spring 2000 to 2010 (Durner et al. 2010). This period coincides with the most recent documentation of the status of the population (Bromaghin et al. 2016), and with nearly 100 females followed by radio-telemetry to maternal dens during this period, the Durner et al. (2010) data set provides sufficient observations to meaningfully reflect recent patterns in den distribution.

Estimating the number of denning bears—The number of female polar bears seeking dens each autumn can be estimated by the number of adult females in the population and their litter production or breeding rate. In the 1980s, as many as 142 polar bears may have been denning in Alaska or offshore of Alaska each winter (Amstrup et al. 1986, see below). Although the Southern Beaufort Sea polar bear population is now only about half the size it was in the 1980s (Bromaghin et al. 2016), the influence of cub mortality on the multi-year breeding cycle of polar bears means that we cannot simply conclude that half as many females would now be entering dens each year. Polar bears breed at the start of the spring foraging season, and cubs are born in a very undeveloped state the following winter (Amstrup 2003). It is only after birth and initiation of lactation that mother bears invest significant energy in their cubs (Ramsay and Dunbrack 1986), and it is during lactation that the weight gain mother bears were able to achieve the previous summer becomes critical. Nearly all females available to breed (that is all adult females not encumbered with offspring) in spring will do so (Derocher et al. 1992). In years when summer foraging is good, pregnant females enter

dens with enough fat reserves to provide abundant milk to their cubs after birth. In years, when mother bears may not have been very successful hunting and are unable to produce enough milk, their cubs may perish. Having lost her cubs, a mother bear protects her own reserves—assuring she can survive and try breeding again in another and hopefully better year. Hence, the strategy of low pre-birth maternal investment allows female polar bears to defer reproduction in poor foraging years without impacting their own survival. Deteriorating sea ice means that the frequency of “bad” years is higher now than it used to be, and more females are entering dens with insufficient weight gain to nourish cubs after birth. More females losing their cubs means more are available to breed and den again in the same year they emerged from their last den.

Over most of their range polar bears that are successful in raising cubs normally wean them at 2.3 years of age, meaning they can complete a reproductive effort no more frequently than every 3 years. Due to early weaning (always rare in the Beaufort Sea) or early cub mortality (which is now common), the breeding interval can be shorter than 3 years. Due to loss of older cubs, mother bears needing a break from reproduction in order to rebuild body stores, or other unknown factors, the breeding interval also can be longer. The estimated number of females denning each year in the 1980s was based on an observed average breeding interval of 3.6 years. At that time, more females than now were well nourished and able to complete their reproductive cycle, but there were some apparent interruptions preventing the perfect 3-year breeding interval. Dividing the 3.6-year breeding interval into a population size estimated at that time to be 511 adult females, yielded the estimate that approximately

142 were annually entering dens in the Southern Beaufort Sea region during the 1980s (Amstrup et al. 1986).

Currently, the Southern Beaufort Sea population is only about half of what it was in the 1980s with an estimated 236 adult females (Bromaghin et al. 2016, supplemental online material). But, the proportion of cubs and yearlings in the population also is less than half of what it was in the 1980s, suggesting the present survival rate of cubs is only about half of what it used to be (Amstrup 1995). With more females losing cubs shortly after den emergence, we would expect a higher proportion of females that had lost their cubs in spring, to be entering dens each year. In essence, the breeding interval has increasingly become severed from the true reproductive interval. In other words, although females are breeding and producing cubs, poor survival means those cubs are not being recruited into the population. Because the breeding interval is approximately the reciprocal of the breeding rate (Ramsay and Stirling 1988), a 1.8-year cycle would mean a breeding rate or probability of $\sim 0.55^2$. With a population of ~ 236 females, and a breeding interval of 1.8 years we could expect ~ 131 bears to be denning each winter³.

Estimating the distribution of denning bears—In the 1980s, when as many as 142 polar bears may have been denning in Alaska or offshore of Alaska each winter (Amstrup et al. 1986), only 46% or 65 dens may have been on land each winter (Amstrup and Gardner 1994). Due to declining availability of sea ice habitat suitable for denning, members of the Southern Beaufort Sea polar bear population increasingly

² Because the breeding interval does not account for litter size, and because proportions of cubs in the population represent some litters of multiple (usually 2) cubs. The actual breeding probability is most probably higher than 0.55. So this estimate must be considered conservative.

³ Modeling the polar bear's life cycle against demographic data collected from 2001-2005, Regehr et al. (2009) estimated an almost identical breeding probability of 0.541.

have chosen to den on land. Fischbach et al. (2007) determined 63% of radio collared bears entered dens on land, and between spring 2000 and spring 2010, 76 of 99 dens (77%) located by radio-telemetry were on land (Durner et al. 2010)⁴. Of these recent dens 15 (15%) were on the Arctic Refuge Coastal Plain, suggesting we could expect 20 dens (15% of 131 dens) each year on the Arctic Refuge Coastal Plain. Drafters of the DEIS concluded 22% of known maternal dens between 2000 and 2010 were on the Arctic Refuge Coastal Plain (Vol. 1, 3-128). Multiplying 0.22 by the estimated 131 females likely denning each year suggests up to 29 maternal dens may be found annually within the bounds of the Arctic Refuge Coastal Plain.

Considering varying assumptions and current and future conditions, the best estimate for future annual denning on the Arctic Refuge is on the upper end of the estimated range (20-29) of dens occurring each year on the Arctic Refuge Coastal Plain. For starters, proportions of cubs in the population represent some litters of multiple (usually 2) cubs and estimating the breeding probability as the reciprocal of the breeding interval does not account for variation in litter size. Therefore, the actual current breeding probability is likely higher than 0.55. Add to this, the fact that cub mortality is only likely to increase as sea ice quality and availability continues to negatively impact foraging abilities. This means that whatever breeding probability is now, it is likely to be higher in the future as more and more females confront increasingly frequent poor foraging conditions, and reproductive success becomes lower. Also, the proportion of female polar bears choosing to den on land has continued to increase, from 46% in the 1980s to 77% between 2000 and 2010. Finally, summer-

⁴ As in past studies, bears denning on land-fast ice adjacent to shore are included with dens on land.

time land use has increased three-fold (Atwood et al. 2016) in recent years, and numbers of bears on land in summer is expected to continue to increase. Because there are few nutritious foods available on land, a majority of the Southern Beaufort Sea polar bears that spend all or part of summer on land take advantage of supplemental food in the form of whale remains at the “bone pile” near the village of Kaktovik (Atwood et al. 2016)⁵. Higher numbers of bears supplementing their pre-denning foraging near Kaktovik is likely to translate into higher numbers of bears denning on the adjacent Arctic Refuge Coastal Plain close to this large food source. Therefore, for purposes of estimating the number of dens that may be impacted by oil and gas development of the Arctic Refuge Coastal Plain, it seems likely that 29 or more maternal bears will den there each year as we go into the future.

How many maternal denning bears will be impacted?

Drafters of the DEIS suggest dens will be detected and avoided by use of forward looking infrared (FLIR) surveys conducted in advance of on-the-ground activities (see below, discussion of advance detection of dens). The track record of such surveys in active oil field areas west of the Arctic Refuge reveals significant limitations, however. Between 2004 and 2016, FLIR surveys conducted in advance of various oil field operations along Alaska’s North Slope correctly identified 12 maternal dens but missed 11 dens (essentially a 50% detection rate) that were within the survey areas. The denning habitat on the Arctic Refuge Coastal Plain is more expansive and far more complex than other areas of Alaska’s north slope where oil and gas activity has

⁵ The “bone pile” is where remains (not consumed by people) of bowhead whales (*Balaena mysticetus*) harvested by residents of the Kaktovik community are deposited.

occurred—and where FLIR has been used to find dens. Therefore, it seems unlikely detection rates on the Arctic Refuge Coastal Plain will be any higher than the ~50% historic record. With between 20 and 29 pregnant females denning on the much more expansive and complicated Arctic Refuge Coastal Plain each year, and with a ~50% detection rate for FLIR, half or between 10 and 15 of the dens annually expected to occur on the Coastal Plain are likely to be undetected before seismic testing begins in winter.

Assuming there are 10-15 undetected maternal dens on the Arctic Refuge Coastal plain, we can estimate how many dens will be disturbed by the proposed 3D seismic testing⁶. With seismic vehicles leaving a footprint approximately 3m wide, ~3% of the Arctic Refuge Coastal Plain, and the denning habitat, would be run over by tracks of these vehicles. Additionally, past observations suggest that seismic vehicle traffic and associated activities can cause den emergence for females within ~65-meters of the seismic survey lines (Amstrup 1993). Observations suggest great individual variability in sensitivity to disturbances outside the den (Amstrup 1993). Some bears are much more tolerant and likely not to exit their den without far greater stimulus and others seem more sensitive. But, within 65 meters of seismic traffic, past observations suggest many bears are likely to exit their dens, and those that don't may remain inside even as vehicles drive over them. Each 200 x 200-meter seismic grid cell would include a “doughnut hole” of 70 X 70 meters that is not within 65 meters of a survey line. Applying the 65-meter buffer to each side of survey lines would mean 87.75% of each grid cell

⁶ Again, because BLM has failed to provide the public with further information about pending Coastal Plain seismic survey proposals, this analysis considers the most recent proposal from SAExploration that BLM did make public.

would be exposed to disturbance at distances known to cause den emergence. That same buffer intersects 87.70% of the mapped denning habitat on the Arctic Refuge Coastal Plain, verifying the conclusion of Durner et al. (2006) that the distribution of maternal denning habitat on the Arctic Refuge Coastal Plain is essentially uniform. Only 12.30% of all denning habitat on the Arctic Refuge Coastal Plain therefore falls inside the gaps or “doughnut holes” that are not within 65 meters of a survey line. Figure 1 illustrates how completely the Arctic Refuge Coastal Plain would be covered by the proposed seismic survey grid.

The previous paragraph illustrates how much denning habitat will be impacted by the 3D seismic survey proposed by BLM and SAExploration. Estimated numbers of dens that will be impacted by the proposed seismic survey are shown in Table 1. If there are 15 undetected dens on the Refuge, a seismic survey of the proposed intensity and areal extent would have a 36% chance of actually running over the top of and crushing one or more occupied dens, with fatal consequences for the mother bear and or her cubs. If such a survey were conducted multiple times, the average number of dens crushed would be 0.45, and on average 13 dens would be exposed to potential disturbance. Similarly, if 10 undetected dens are present there would be a 26% chance that vehicles would run directly over one or more. And, if there are as few as 4 dens present, it is virtually certain that that at least one occupied den would be exposed within the 65-meter buffer surrounding each side of proposed grid lines. Whereas all bears denning within 65 meters of a survey path may not exit their dens, records show that some will. Even if the immediate effect of such a disturbance is not fatal, early departure from maternal dens leads to poorer cub survival (Amstrup and Gardner 1994,

Rode et al. 2018), and there could be latent lethal consequences. Given the declining status of the Southern Beaufort Sea population is driven largely by poor survival of young, such disturbances, added to immediate mortalities, can only exacerbate ongoing declines.

The calculations in Table 1 are based on the proposed 3D seismic survey being constructed of a 200 x 200-meter grid of survey lines, where the lines are actually paths ~3m wide and a zone of influence extends ~65m either side of the line. In actual practice, however, on-the-ground footprints of seismic surveys conducted as recently as last year have far wider footprints and influenced far more habitat. Aerial photos of the tracks made by seismic testing vehicles working west of the Arctic Refuge during the winter of 2017-2018 reveal that grid lines were actually composed of 2 or more passes by seismic vehicles (Walker et al. 2019). These multiple passes, evident because they were made by vehicles heavy enough they compressed the vegetation and altered snow collection and melt patterns, showed that strips of disturbed habitat were approximately 15 meters in width (<http://fairbanksfodar.com/science-in-the-1002-area>) rather than the 3 meters assumed for calculations in Table 1. In addition to survey lines impacting a much wider path than proposed, there is photographic evidence of numerous “off transect” vehicle paths that crossed the survey grid at numerous angles and with varying concentration. The purpose of multiple tracks is not known, but their presence indicates we cannot assume that seismic testing grids are composed of perfect lines only as wide as one vehicle. If implementation of the seismic plan for the Arctic Refuge includes multiple passes and other off-transect traffic, the zone of influence and the number of dens potentially disturbed would be far greater than shown

in Table 1. With a 15-meter wide footprint, over 14% of the Arctic Refuge Coastal Plain denning habitat would be “run over” by seismic vehicles and 92% of the habitat would be within the 65-meter-wide zone known to disturb some mother bears in their dens (Table 2). If the true path falling under seismic vehicles is 15 meters wide rather than 3 meters wide and if there are 15 undetected dens on the Refuge, each such survey would have a 90% probability of running over one or more occupied maternal dens, and on average (if the survey were repeated multiple times) vehicles would run over 2 maternal dens. If there were 10 undetected dens, there would be a 79% probability that one or more den will be run over, and on average 1.4 dens would be crushed. And, we must remember these outcomes do not include the additional (and *a priori* inestimable) risk from the miscellaneous cross-grid tracks that apparently accompany seismic surveys as they are actually conducted.

Therefore, whether as few as 20 females enter maternal dens on the Arctic Refuge Coastal plain, or as many as 29, the risk of fatal encounters with seismic vehicles is very real and its impacts cannot be described as negligible.

Figure 1. Map of the Arctic Refuge Coastal Plain (1002 area) showing denning habitat (narrow red polygons, Durner et al. 2006), and proposed 200 x 200-meter seismic survey grid (pale orange lines). The grid is so closely spaced it appears merely as shading at the scale of the entire Coastal Plain. The left inset illustrates the seismic grid spacing (orange lines) and a small area of denning habitat (red polygons) at much larger scale. The right inset shows the same larger scale view of the seismic grid plus a 65-meter zone of disturbance (grey-green shading) either side of the survey line. Blue-green squares in the right-hand inset are “doughnut holes” not within the 65-meter zone of influence. Red bands in these doughnut holes reveal how little denning habitat could escape potential disturbance⁷. The dark grey polygon illustrates the Kaktovik Inupiat Corporation lands, which are not included in this analysis because they were not part of the seismic survey application proposed to BLM.

⁷ Denning females >65 meters from transect also may be disturbed. Dens within the doughnut holes, therefore, are not protected from disturbance, but may experience a reduced likelihood of disturbance.

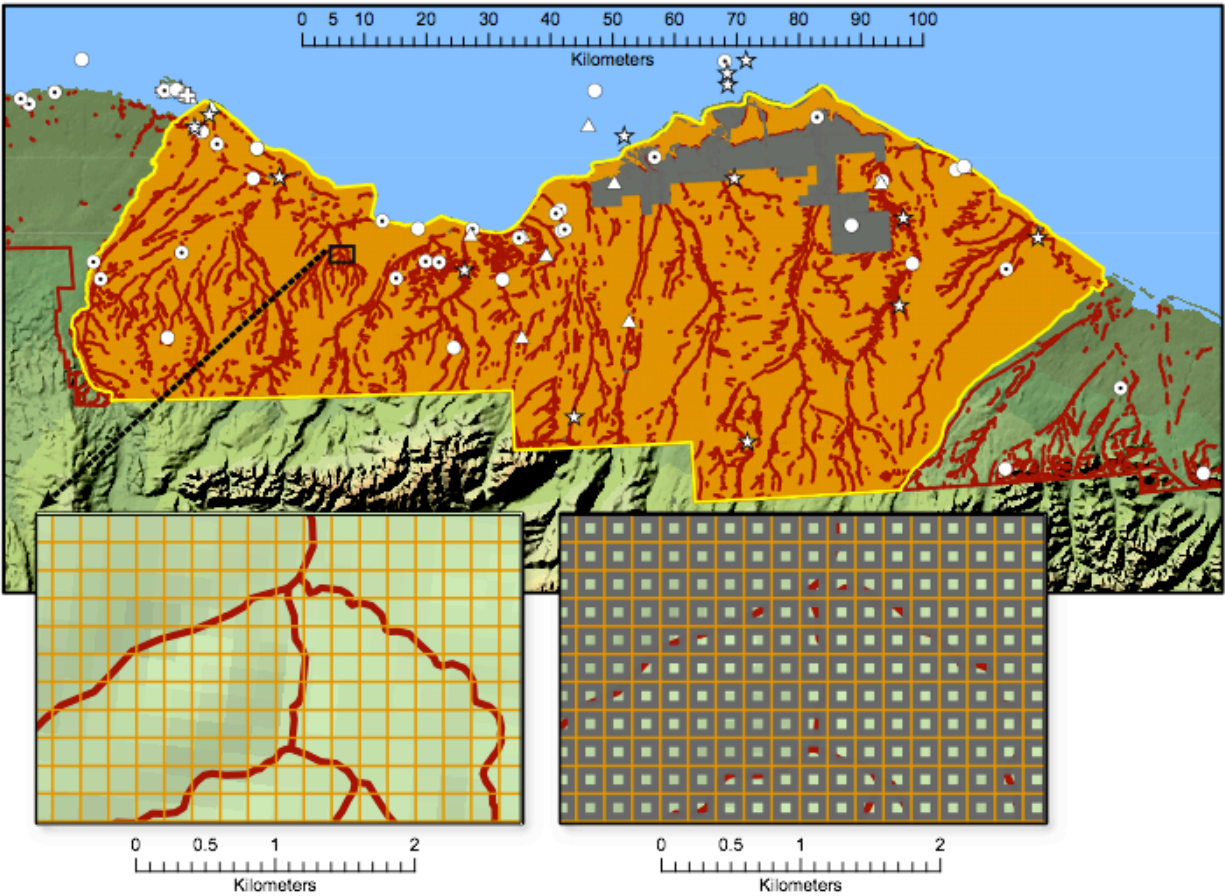


Table 1. Probabilities of disturbance and/or mortality of polar bears resulting from the 3D seismic survey proposed by BLM for the Arctic Refuge Coastal Plain. Probabilities of encounter appear in columns while average (e.g. if multiple such surveys were conducted) number of dens impacted is expressed in the last row. The proportion of available denning habitat covered by the 3-meter wide vehicle path, which corresponds with probability (\hat{p}) of fatal impact, is 0.03, or 3%. If there was one undetected den on the Refuge the probability of not running over it would be $1 - \hat{p}$ or 0.97. The probability of impacting at least one den increases with the decline in the n^{th} power of $1 - \hat{p}$ where n is the number of dens present. For example, if there are 2 undetected dens randomly located on the refuge the probability of not running over either would be $(1 - 0.03)^2$ or 0.94, and the probability of crushing at least one would be $1 - (1 - 0.03)^2$ or 0.06. With 15 undetected maternal dens on the refuge, there is a 36% chance seismic vehicles would drive over at least one of them. Similarly, if there are 4 or more undetected dens on the Refuge, the chance that one or more will fall within the 65-meter disturbance buffer approaches 100% (in other words, the probability that none of the four will be within the 65-meter disturbance buffer becomes infinitesimally small). Whereas all bears denning

within 65-meters of a survey path may not exit their dens, records show that some will. Even if the immediate effect of such a disturbance is not fatal, early departure from maternal dens leads to poorer cub survival (Amstrup and Gardner 1994, Rode et al. 2018), suggesting there could be latent and undetected lethal consequences.

# DENS PRESENT	DEN RUN OVER \hat{p}	DEN NOT RUN OVER $1 - \hat{p}$	DEN DISTURBED \hat{p}	DEN LESS DISTURBED ⁸ $1 - \hat{p}$
1	0.03 ⁹	0.97	0.88	0.12
2	0.06	0.94	0.94	0.06
3	0.09	0.91	0.99	0.01
4	0.11	0.89	1.00	0.00
5	0.14	0.86	1.00	0.00
6	0.17	0.83	1.00	0.00
7	0.19	0.81	1.00	0.00
8	0.21	0.79	1.00	0.00
9	0.24	0.76	1.00	0.00
10	0.26	0.74	1.00	0.00
11	0.28	0.72	1.00	0.00
12	0.30	0.70	1.00	0.00
13	0.32	0.68	1.00	0.00
14	0.35	0.65	1.00	0.00
15	0.36	0.64	1.00	0.00
MEAN ¹⁰	0.45		13.16	
VARIANCE	0.44		1.61	

⁸ Denning females >65m from transect also may be disturbed. Dens within the doughnut holes, therefore, are not protected from disturbance, but may experience a reduced likelihood of disturbance.

⁹ Table entries rounded to 2 decimal places.

¹⁰ The mean of the binomial distribution is $n \cdot \hat{p}$ (n times \hat{p}) and the variance is $n \cdot \hat{p}(1 - \hat{p})$. If there are 15 undetected dens on the refuge therefore, each survey like that proposed by BLM would disturb ~13 dens, and seismic vehicle tracks would directly run over ~0.4 of a den. Lethal disturbances are virtually assured when a heavy vehicle actually runs over an occupied den.

Table 2. Probabilities of disturbance and/or mortality of polar bears caused by seismic testing. As in Table 1 except assuming multiple seismic vehicle paths and 15-meter impact zone. With a 15-meter impact zone along grid lines, there is a 90% probability that at least one den would be run over. And the average for a survey like this would be to run over 2+ dens.

# DENS PRESENT	DEN RUN OVER \hat{P}	DEN NOT RUN OVER $1-\hat{P}$	DEN DISTURBED \hat{P}	DEN LESS DISTURBED $1-\hat{P}$
1	0.14	0.86	0.92	0.08
2	0.27	0.73	0.99	0.01
3	0.37	0.63	1.00	0.00
4	0.46	0.54	1.00	0.00
5	0.54	0.46	1.00	0.00
6	0.61	0.39	1.00	0.00
7	0.66	0.34	1.00	0.00
8	0.71	0.29	1.00	0.00
9	0.75	0.25	1.00	0.00
10	0.79	0.21	1.00	0.00
11	0.82	0.18	1.00	0.00
12	0.85	0.15	1.00	0.00
13	0.87	0.13	1.00	0.00
14	0.89	0.11	1.00	0.00
15	0.90	0.10	1.00	0.00
MEAN	2.17		13.87	
VARIANCE	1.85		1.05	

Failure to acknowledge the inability to detect dens in advance—Much of the justification for concluding that impacts on polar bears from activities described in the DEIS might be negligible stems from claims that “denning surveys” conducted in advance of on-the-ground activities would mean only a “small number” of maternal denning bears would be impacted (DEIS at 3-146). On page 3-141, the DEIS asserts that denning surveys would “minimize” potential risks; on page 3-138, the DEIS concludes that “Behavioral disturbance on the productivity of polar bears in the program area is likely to be low” based on the assumptions that “all mitigative measures are implemented... and that preconstruction den surveys detect **most** maternal dens in the affected areas.”; on page 3-137, the DEIS relies on use of surveys to assert that ITRs will ensure that impacts on occupied dens are “negligible”; on page 3-134 the DEIS says that use of FLIR and dogs has proven to be effective.

Available evidence, however, confirms these claims for reliability of denning detection surveys are unfounded. Dens are invisible to the eye throughout winter and attempts to discover them have relied on forward looking infrared (FLIR) surveys designed to detect the heat emitted by denning mother bears and their cubs. Research published 14 years ago and refined 4 years ago (Amstrup et al. 2004, York et al. 2004, Robinson 2014) emphasized shortcomings in such surveys. Some of the shortcomings can be overcome by multiple surveys and by limiting surveys to weather conditions ideal for FLIR operation. In practice, however, the den detection rate of FLIR, as it has been applied in oil-field areas west of the Arctic Refuge, has been unacceptably low. Between 2004 and 2016, FLIR surveys conducted in advance of various oil field operations along Alaska’s North Slope correctly identified 12 maternal dens but missed 11 dens that were

within the survey areas (Smith et al. In Prep). These surveys also identified 22 “hotspots” that were presumed to be maternal dens but turned out not to be dens. So, not only did these surveys miss almost as many dens as they detected (11 versus 12, an approximately 50% detection rate), they also led to much wasted time and effort—as staff attempted to monitor and avoid sites that were not dens at all.

A survey conducted in February of 2018 suggests FLIR surveys might be even less effective in the more complicated terrain of the Arctic Refuge Coastal Plain. At that time, the U.S. Fish and Wildlife Service contracted a 10-day intensive FLIR survey over portions of the Arctic Refuge Coastal Plain and adjacent habitat that is known to be used frequently by denning females. Ten hotspots were recorded (Owyhee Air Research, Inc. 2018), but only 2 actually turned out to be dens. There were no known (by radio telemetry) dens in the area searched, so we cannot know how many dens this FLIR survey aircraft actually flew over and failed to detect. However, based on recent patterns of observed denning, nearly 30 denning bears could have been on and immediately adjacent to the Refuge last winter. Many of these dens could have been in the area within which this February 2018 FLIR survey was conducted, and several dens may have been missed. The higher density and greater complexity of denning habitat on the Coastal Plain, and thicker snow collecting over the tops of dens in the more-deeply incised gullies on the Arctic Refuge, increase likelihood that more dens will be missed compared to flatter and more well-defined habitats farther west. All of these factors make it likely that FLIR den detection methods, which have been only about 50% successful in the existing oil field areas, are likely to be even less successful on the Arctic Refuge Coastal Plain.

The DEIS suggests that ground-truthing with search dogs can enhance detections. Carefully trained dogs can find dened bears. However, dogs that have been used in Alaska mark the locations of dens by digging into them, and therefore must be retrieved by their handlers before they compromise the den. Dogs attempting to dig into dens simulates the activity of wolves and other bears, the only predators that can be a threat to polar bears (Richardson and Andreashek 2006, Amstrup et al. 2006). At the very least, using such dogs to find dens is an added source of stress that may cause den abandonment/relocation during a time in the denning cycle that could impact young cubs. More importantly, dogs have historically been used only in small areas with relatively high historic denning frequency, or to verify whether a FLIR hotspot was a den. Dog surveys in mid-winter require travel by Tucker or other enclosed vehicles to protect dogs from the harsh weather, and dogs are often outside searching for only relatively brief periods. Dogs have never been used to search expansive areas of habitat. Suggesting they can efficiently, effectively, and without probable disturbance of denning bears, search the 3000 km of denning habitat on the Arctic Refuge Coastal Plain seems dubious at best.

The DEIS acknowledges that den detection surveys are “not perfect” (3-134) but gives no hint that they actually have been effective only about half the time—a much lower detection rate than most reasonable people would call just “not perfect.” At present, there is no reliable way to assure that dens will not be affected by exploratory surveys or subsequent development activities.

The DEIS acknowledges that the Southern Beaufort Sea polar bear population is in decline and that its status can only become more precarious as we move into the future. The DEIS also acknowledges that activities related to oil and gas development, if allowed in the Arctic National Wildlife Refuge, will further compromise the status of the polar bear population. Seismic testing and other on-the-ground activities, regardless of the presumed safeguards described in the DEIS, are highly likely to cause direct mortalities of polar bear mothers and/or their cubs. They are certain to increase stresses in denning and non-denning animals, and they are virtually certain to accelerate the decline in abundance of this population. Given that the Southern Beaufort Sea polar bear population declined from around 1800 in the 1980s to approximately 900 animals in 2010 (Bromaghin et al. 2016), the added disruptions described in the DEIS are inconsistent with population conservation and established management and conservation plans.

Selective protection of denning habitat—The DEIS argues that special protections afforded to parts of the Arctic Refuge Coastal Plain also can serve to minimize impacts to maternal denning bears. Alternative D for example, suggests placing a one-mile wide buffer on each side of several streams and running inland from the coast for 5 miles. The purported justification for these restrictions is that 37% of dens observed in the past were on or near these stream segments (3-147). These restrictions to protect areas frequently used in the past are, of course, better than “no restrictions.” However, offering special protections for a small amount (8.8%) of identified denning habitat prompts serious questions. Most important among those questions is that they ignore areas composing 92% of denning habitat. Even if 37% of

pregnant females choose future dens in these protected areas, what about the habitat elsewhere on the Arctic Refuge where the majority (63%) of bears have denned in the past? Given that the Southern Beaufort Sea polar bear population is declining due largely to poor survival of cubs, the BLM should be working to maximize protection for all of the denning mother bears and not implementing management actions that it admits will compromise those protections.

Although we have no evidence of individual bears returning to the same den location in multiple years, we know they do tend to return to the same general location (Amstrup and Gardner 1994). Some pieces of den habitat have seemed more “preferred” than others, but these “preferences” are not always hard and fast. For example, an abandoned staging pad on the coast near Prudhoe Bay was used repeatedly for many years but has apparently not been used recently. We know that the Arctic Refuge Coastal Plain habitats have been consistently preferred since the earliest data on denning have been collected. We don’t know why some areas within the Refuge may previously have been preferred over others that have similar habitat and snow depth features. But we do know that as human-caused climate change continues, the distribution of snow will be changing, and coastal erosion will alter some currently desirable locations. Sections of suitable den habitat that have been preferred for maternal denning in the past may become less preferred and other less used areas of suitable habitat may become more preferred. We also know that the Southern Beaufort Sea polar bear population is experiencing serious decline due in large part to poor survival of cubs (Bromaghin 2016). Therefore, BLM should protect all identified habitat to assure polar bears face the fewest restrictions possible in giving birth to their cubs.

As discussed in the section on seismic testing, because of poor cub survival, the numbers of bears constructing dens on the Arctic Refuge Coastal Plain may not have greatly declined, despite significant population declines. And, there are reasons to expect maternal denning on the Arctic Refuge Coastal Plain may increase in the future. Up to 20% of the Southern Beaufort Sea population is currently spending all or part of summer on land (Atwood et al. 2016). This is in contrast the 1980s when polar bears did not spend summer on land. Also, a majority of bears now stuck on land in summer spend at least some time at the Kaktovik bone pile¹¹, which is the only consistent source of high energy food on land in northern Alaska. Higher numbers of bears that supplement their pre-denning foraging in Kaktovik is likely to translate into higher numbers of bears denning on the adjacent Arctic Refuge Coastal Plain to be closer to this food source. All indications are that numbers of polar bears denning on the Arctic Refuge Coastal Plain will continue to be high in the absence of the proposed oil and gas program. The distribution of den sites may or may not differ from that in the past, but the long history of polar bear preference for maternal denning on the Arctic Refuge Coastal Plain emphasizes the importance of protecting all, rather than only a portion, of the available denning is paramount.

After proposing that spatial restrictions on activities in certain drainages will mitigate impacts, the DEIS goes on to conclude (3-148): “Nevertheless, expansion of oil and gas development along the arctic coast on both land and sea may reach a level at which such effects become problematic for polar bears in the future”. Avoiding such

¹¹ The “bone pile” is where remains (not consumed by people) of bowhead whales (*Balaena mysticetus*) harvested by residents of the Kaktovik community are deposited.

“problematic” consequences for the species is precisely why keeping the Arctic Refuge Coastal Plain undeveloped is important.

The DEIS recommends special protections for some denning female bears (e.g. ROP 10 (2-20)). Such provisions, however, are only of value if locations of dens are known. In the past, only about half of the dens in areas surveyed with forward looking infrared (FLIR) have been detected. This means that half of the dens on the Coastal Plain area in any given year will be undetected and vulnerable to possible disruption. Also, this operating procedure states that “alternate protective measures (for detected dens) may be approved by BLM Authorized Officers.” But it does not explain what kinds of protective measures might be invoked or how BLM would evaluate and approve them. Given that this proposed activity is on a National Wildlife Refuge, in an area of critical habitat, and mandated for protection in order to aid polar bear reproduction; details of what kinds of protections might be invoked, and how den detection rates will be improved, are necessary. Similar language occurs elsewhere in the DEIS. For example, at 3-102 the DEIS states “Exceptions to stipulations of no surface occupancy would be made for roads, pipelines, barge landings, and docks.” There is, however, no explanation of what conditions and at whose discretion these protections would be waived. This kind of language could be used to void even the minimal protections for polar bears described in the DEIS and is totally unacceptable. Given the likelihood that protections proposed in the DEIS are unlikely to provide polar bears the protections they need, it is especially alarming that even those protections might be waived without explicit descriptions of why.

Improper reliance on the “success” of past mitigation—The DEIS suggests repeatedly that past mitigation efforts have been successful in preventing non-negligible impacts on polar bears, claiming for example (3-137) that the “types of activities typical of oil and gas exploration, development, and production projects in northern Alaska were not likely to have population-level effects on polar bear populations....” The DEIS describes incidental take regulations (ITRs) as the principal mechanism for regulating human activities in regard to polar bears (3-140). The current regulations allow industry operators non-fatal takes of small numbers of polar bears provided that such takes result in negligible impacts on the species. It is critical to note, however, that the protections adopted in ITRs can be applied only once a bear or den is detected. The principal challenge for protecting bears in maternal dens, the most important threat to polar bears from activities proposed in the DEIS, is detecting them (see section on seismic survey). Whereas industry has been pretty good at implementing avoidance procedures when dens or bears are detected, we know that detection rates have been too low to be considered adequate protection for denning bears. There is no documentation of how many undetected dens may have been disturbed over the years of oil and gas activities in Alaska. Importantly, we also do not know the fate of bears (disturbed before being detected), after they left the denning area from which they were disturbed. We usually do not know whether cubs survived to weaning age after they traveled out of sight onto the ice or whether they perished shortly thereafter. What we do know is that post-birth cub loss of recent years is more than double that of the past, and we know that mother bears that stay in dens longer are more successful in rearing their cubs (Amstrup and Gardner 1994, Rode et al. 2018). We also know that the habitat

complexity and density of maternal dens on the Arctic Refuge Coastal Plain are far greater than other parts of Arctic Alaska where oil and gas exploration and development have occurred. Because previously implemented “safeguards” have been at most marginally effective elsewhere, we can be confident they will be less effective on the more complicated habitat of the Arctic Refuge Coastal Plain, and that the numerous impacts described in the DEIS can only further compromise this already compromised population.

Although they offer little protection for denning bears, the DEIS argues ITRs have potential value for prevention of conflicts between free-ranging polar bears and humans. Bear/human interactions in the existing oilfields have been increasing in recent years as more bears are spending more time on land. The DEIS makes the case that, despite numerous encounters, lethal takes associated with oil and gas activities have been rare (3-140). The DEIS reports only three polar bears killed at oil and gas industrial sites in Alaska since the late 1960s. Four additional bears were killed as a result of human interactions and died away from oil field facilities. One of these was a defense kill at a military radar station. The other three were polar bears that ingested toxins from unknown sources.

Two personal examples illustrate the kinds of interactions that could become common if oil field activities expand into the Arctic National Wildlife Refuge as polar bear welfare is declining due to sea ice loss. In September 2002, I had to kill a severely emaciated bear that was posing a safety threat to workers traveling to and from the Endicott Island production facility. This bear had become so aggressive it was attacking vehicles passing by. Attempts to deter the actions and drive the bear away were

unsuccessful. This situation posed imminent threats to workers in the area, and after consultation with the U. S. Fish and Wildlife Service, I went out and killed the bear before a worker could be injured or killed. During the same autumn season, I had to help kill a bear that had taken up residence under a house in the village of Utqiagvik (previously known as Barrow). This was a very large male in prime condition. Part of its prime condition may have been attributed to the fact that its recent activity had been limited to sleeping under a local resident's house by day and feeding on the food caches of local people by night. The attraction of this "artificial" food overcame any of the bear's natural fears of being around people. Whereas the owner of the house under which the bear was sleeping might have been concerned, the village had a bigger concern. This house was right next to the path along which dozens of primary school children walked to and from school each day. After attempts to haze the bear away failed, it was decided human safety concerns prevailed and the bear had to be killed. The bear killed in the oilfield probably would have died regardless of my intervention. The point raised by that bear, however, is that more and more desperately hungry bears, like that one, are assured to be on shore as sea ice continues to decline. Most will be attracted to the Kaktovik bone pile, and if the developments described in the DEIS take place, their opportunity to present life-threatening conflict situations will increase. The Utqiagvik bear shows that problem bears don't necessarily have to be starving. The mere presence of large numbers of bears in close proximity to people, and seeking supplemental food while they wait for the sea ice to freeze or for enough snow to enter maternal dens, increases the likelihood that bears will be killed to defend human safety. Considering the numbers of bear/human interactions that have

previously occurred in Alaska's oil fields, the number of fatal incidents does seem low. When the population was growing and robust, this small number of fatal interactions may have been inconsequential. But in a population already declining, and facing continuing loss of foraging habitats, even small numbers of human-caused deaths, may hasten the ongoing decline. The examples above verify that in the future, we can anticipate numbers of serious incidents are unlikely to remain small, but rather can be expected to increase.

Are past impacts of oil field activities understood and applicable?—The DEIS states repeatedly that exploration and development of the Arctic Refuge Coastal Plain region will result in added impacts on the population. Although the DEIS also repeatedly asserts that all impacts from developments will be magnified by ongoing global warming and its associated sea ice decline, it doesn't adequately address the impact of sea ice decline, or other symptoms of global warming, on likely future human/bear conflicts. In 15 years, the numbers of bears spending summer on land has tripled (Atwood et al. 2016) and increasing numbers of bears are loitering around the village of Kaktovik—the only place on Alaska's northern coast where highly nutritious food is predictably available. Numbers of maternal dens and numbers of free-ranging polar bears historically have been higher in the Arctic Refuge area than other parts of Alaska's Arctic where oil and gas activities have occurred. Polar bear/human interactions, Arctic wide, have been increasing as sea ice has declined (Towns et al. 2009, Atwood et al. 2017), and further increases are virtually assured. The "success" of Incidental Take regulations is cited as assurance that industry operations in the Arctic

Refuge will have only “negligible” impact on polar bears. The lessons of the past, even if learned perfectly, simply may not apply in the current situation.

The Southern Beaufort Sea polar bear population is experiencing catastrophic decline even without any new perturbations. Therefore, there is no such thing as a “sustainable” additional yield, the concept of a maximum potential biological removal (PBR)¹² does not apply, and no additional impacts could be considered negligible. Persistence of the population depends on a halt to the rise of atmospheric greenhouse gas concentrations. The USFWS Conservation Management Plan (2016) has declared the Arctic Refuge Coastal Plain as habitat critical to preserving as many polar bears as possible until greenhouse gas rise is halted. BLM should be working to meet the objectives of the Conservation Management Plan for polar bears (USFWS 2016) and to eliminate negative impacts rather proposing significant new ones.

The DEIS acknowledges that as a result of global warming induced sea-ice declines, polar bears have had to make longer and more laborious movements from the sea ice to denning areas (3-125). Hence, requiring additional movements to avoid new structures and activities in coastal regions of the Arctic Refuge will compound ongoing negative impacts by requiring more energy drain to accomplish even greater movements. Because polar bears can only become progressively less well-nourished as sea ice continues to decline, added movements during the critical pre-denning time of year are sure to result in increasingly negative impacts. The more energy a female must expend to access, establish, and maintain her maternal den, the less energy she

¹² The **potential biological removal (PBR) level** is defined by the Federal Marine Mammal Protection Act as the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population.

has to give to her cubs. Similarly, forcing the increased number of bears that are spending more time on land and therefore are hungrier, to move around new activities and infrastructure, is almost sure to lead to even greater increases in bear/human conflict situations. The DEIS correctly points out that consequences of these more frequent interactions can be severe, but it offers no suggestions for eliminating those consequences.

Cumulative Oil Field Impacts and Worsening Climate Change

Can timing of human activities reduce impacts?— Female polar bears have made little maternal investment at the time they are establishing their dens in the autumn (see section on seismic impacts). Some observations suggest they are more willing to relocate if disturbed from a denning location at that time of year (Belikov 1976). Years ago, I proposed this could mean that if activities which could be disruptive to denning activity are begun in autumn, they might cause mother bears to move away from denning sites they would have chosen but where there will be winter-time disturbances (Amstrup 1993, DEIS: 3-136). In moving, these bears would relocate to a site where winter industrial activities might not occur or would be less intense. In contrast to the seemingly logical hypothesis, the reality is quite different. In practice, many oil and gas activities require solidly frozen ground and hence cannot start early enough in winter to precede the time when bears are establishing dens. Also, oil field activities often do not occur at uniform intensity throughout winter, rather they often “ramp up” in intensity after ground is solidly frozen and snow covered. So even though autumn activities might be at a level tolerated by a pregnant bear, the intensity of activities may escalate to non-tolerable levels later in the winter. More important is that

even if development activity levels did remain constant through winter and if initiating activities in autumn resulted in a “gentle push” to assure bears didn’t den too nearby, ongoing impacts of climate change mean the situation is different. When I suggested that strategy, we had a flourishing population with high reproductive and survival rates.

Global warming induced sea ice loss and potentially other factors have negatively affected bears’ nutrition, body weight, and reproductive performance. With more female bears already energetically compromised, stimulating pregnant females to relocate and seek alternative den sites could impose an added and significant energetic cost on the mother bear that could have a latent effect on her survival or the survival of her cubs. Under ideal circumstances, there might be minimal impact on females forced to relocate den sites. However, these are not ideal circumstances. Even if it was true in the past that autumn relocation to an alternate den site merely caused annoyance, it is more likely now that serious harm could result from the increased effort to find an alternative den location. Females are already having increased difficulty providing sufficient provisions for their young, and any unnecessary energy drain can only exacerbate ongoing declines in maternal welfare and cub survival.

Habitat fragmentation—The DEIS records a long list of the negative effects that will result from exploration and development of the Arctic Refuge Coastal Plain. The DEIS also repeatedly states that ongoing climate change and its associated loss of sea ice habitat will compound impacts associated with development. Yet, after describing various impacts, the DEIS does not rationally reconcile the descriptions with its repeated claims that impacts will be negligible. For example, the DEIS claims that “although the potential for injury or mortality could be high when developing new oil and

gas projects in polar bear habitat, the risks are well understood” (3-142) and that mitigation efforts of the past have been effective. Even taken one at a time each of the possible impacts of Arctic Refuge development cannot be considered negligible. The negative impacts on maternal denning alone are virtually certain to exacerbate the ongoing population decline. Taken together and including the fact that the DEIS repeatedly acknowledges the compounding effects of climate change, a finding of negligible impact is illogical at best and irresponsible at worst.

The DEIS describes an extensive industrialization of the Coastal Plain as a Reasonably Foreseeable Development scenario (Appendix B). It assumes there will be barge landings, staging pads, and a seawater treatment plant located along the coastline. It also assumes road/pipeline connections to the seawater plant. (p B-15-16). Although the DEIS claims impacts of new developments are well understood, it only states these developments will occur but doesn't address how that understanding will eliminate negative impacts. For example, nearshore infrastructure and the human activities associated with it are likely to displace bears to more inland denning sites that might be less desirable and in which they might be less successful in their reproductive effort. More than 80% of maternal dens found on land by radio-telemetry in the Alaskan Beaufort Sea were within 10 kilometers of the coast and over 60% were right on the coast or on coastal barrier islands (Amstrup 2003). Although there is abundant satisfactory denning habitat farther inland, in the foothills or mountains, this distribution indicates that bears prefer to den near the sea where minimal effort is required to find and enter a den and where they are close to the sea ice hunting habitat when they emerge in spring. Denning close to the sea also may be a way to minimize predation

risk. Young cubs are at risk from predation by wolves when they are enroute from the den to the sea ice (Richardson and Andreashek 2006). Females emerging from dens near shore minimize the distance they must travel from the den to get onto the sea ice, reducing both the energy expended and exposure to predation risk.

Concerns about potential obstacles bears face while reaching denning habitat are exacerbated directly by warming-induced sea ice decline, but are neglected in the DEIS descriptions. Increasingly, bears coming ashore to den have had to travel greater distances (DEIS 3-125) including prolonged swims (Durner et al. 2011, Pagano et al 2012). Greater movement means bears expend more energy to reach denning areas than they did in the past. Some female bears may move around or through the various kinds of infrastructure encountered as they are coming ashore and move to alternative locations. Others that are initially tolerant may find themselves denning near enough to infrastructure and related disturbances that escalating disturbances in winter or spring cause them to leave the denning area sooner than they would have in the absence of disturbance. Whether a bear moves farther inland in autumn than otherwise would have been the case or is disturbed after den establishment by intensifying winter activities, the extra energy required can only compound the negative energy balance many mother bears in the Southern Beaufort Sea currently experience.

Cumulative effects—Additional pre-denning energy demands, like moving to alternative and potentially deeper inland denning areas, can only be negative. Although the significance of such added energy drain is difficult to estimate, it is one more potential contributor to cumulative effects of Alaska's coastline developments. Currently oil and gas developments extend approximately 185 kilometers from the Colville Delta

to Pt. Thompson. Development of the Arctic Refuge Coastal Plain would extend that development corridor another approximately 90 kilometers to the vicinity of Barter Island. This expansion would mean that essentially half of the Arctic Coast of Alaska is occupied in some form by industrial developments, and the previously pristine coastline pregnant polar bears visit each autumn would be fragmented by human developments, like much of the rest of the Alaska coast. Roads and pipeline corridors running parallel to the coast may influence polar bears to deviate from historically preferred pathways to their denning areas. These impacts would not only compromise bears preferring to den on the Arctic Refuge, but also the habitats between Prudhoe Bay and the Refuge. Some of the most frequently used denning habitat in Alaska is found in the coastal area immediately to the west of the Arctic Refuge boundary. Although cumulative effects of development expansion have not been assessed, additional energetic costs must have occurred as bears negotiate them. Therefore, it is hard to imagine additional habitat fragmentation will not require more energetic costs as polar bears are forced by new developments to alter movements and habitat uses.

There are no studies showing that effects of the existing oil and gas developments in Alaska have been directly detrimental to polar bears at the population level. There are reasons, however, why possible negative effects of past developments should not be overlooked. Consider the trajectory of the Southern Beaufort Sea polar bear population. By the mid-1980s, the polar bear population in the Southern Beaufort Sea was robust and recovering from decades of excessive harvest that began in the 1950s (Amstrup 1995, Amstrup et al. 1986). By the late 1990's, however, the population trend had reversed and since then the population has declined by about half

(Bromaghin et al. 2016). We are confident that the major contributor to the ongoing population decline among Southern Beaufort Sea polar bears is global warming induced loss of the sea ice habitat upon which polar bears depend for catching their seal prey. Despite the fundamental link between declining polar bear welfare and declining availability of sea ice, we cannot overlook the hypothesis that the expanding human footprint in and near polar bear habitat also may have played a role in contributing to the recent declining trend in Southern Beaufort Sea polar bear numbers. Population declines since the late 1990s, have coincided with major expansion of oil exploration and development activities, and the parallels in timing between oil field expansion in Alaska and declining welfare of the polar bear population should at least give pause to the conclusion in the DEIS (3-142) that the risks of development and how to eliminate those risks are “well understood.” Even if we did understand past impacts, the Southern Beaufort Sea polar bear population now is severely compromised. And, any additional negative impact needs to be viewed differently than when the population was thriving.

Conclusions:

The Southern Beaufort Sea polar bear population has been on a declining trend since the early 2000s (Bromaghin et al 2015). Despite considerable interannual variation in sea ice conditions, the secular warming trend resulting from increasing greenhouse gas concentrations guarantees that the long-term trend in sea ice and polar bear numbers will continue to be downward. Recognizing this, the Polar Bear Conservation Management Plan (U. S. Fish and Wildlife, 2016) warns that without mitigating greenhouse gas rise, it is unlikely that polar bears will be recovered, and calls for prompt action to reduce greenhouse gas emissions. The Conservation Management

Plan also calls for specific “on-the-ground” management measures, that will contribute to the survival of polar bears in the interim (until effective greenhouse gas mitigation is in place). The exploration and development actions described in the DEIS, however, conflict directly with stated objectives of protecting polar bears on the ground. The developments and associated activities described in the DEIS are sure to accelerate ongoing declines in the Southern Beaufort Sea polar bear population.

The most serious inadequacies in the DEIS include: failure to describe the intensive seismic exploration that will precede any on-the-ground developments and the impacts of that exploration on denning polar bear families; failure to recognize the shortcomings of past mitigation measures; failure to recognize the additional complications working in the more complex habitat of the Arctic Refuge will present; failure to fully consider how ongoing climate change will increase uncertainties and complicate impacts associated with proposed operations; and failure to acknowledge the cumulative impacts of expanding oil and gas activities into the undeveloped Arctic Refuge.

Impacts of seismic testing—Information presented in this DEIS (Vol 1, 1-128) and available information on polar bear breeding rates and cub survival, indicate that between 20 and 29 bears are currently denning on the Arctic Refuge Coastal Plain each year, and that this number is likely only to increase as sea ice continues to deteriorate. The DEIS proposes to avoid denning bears by conducting forward-looking infrared (FLIR) surveys. Historically, however, FLIR surveys, proposed to detect and protect denning bears, have been only about 50% effective. Therefore, between 10 and 15 dens would not be detected by the proposed methods. ***As proposed***, the seismic

testing necessary to guide development activities would cover 88% of maternal denning habitat and depending on how many occupied dens occur on the Refuge in any given year, have up to a 36% chance of running over one or more dens. ***As actually conducted*** (if the survey is accomplished in similar fashion to other 3D seismic surveys recently performed west of the Arctic Refuge), it would cover more than 92% of identified maternal denning habitats and have a 90% chance of actually running over and crushing one or more occupied den. On average such a survey would disturb up to 14 denning mother bears and run over 2 dens (see Table 2, above). The high probability of fatal encounters from seismic testing is inconsistent with management directives to protect polar bears on the ground and can only worsen the ongoing decline in this population.

Shortcomings of past mitigation and new complications—In over 45 years of oil and gas activity on Alaska’s North Slope, neither exploration nor development have occurred where polar bears and their maternal denning habitat are as abundant as they are on the Arctic Refuge Coastal Plain. The more deeply incised and complicated denning habitat of the Arctic Refuge, the higher density of dens and greater numbers of free-ranging polar bears, are certain to complicate mitigation attempts. In addition to population level effects on maternal denning bears, polar bear/human conflicts are virtually certain to occur at higher levels than in the past. With climate change bringing more bears to shore for longer periods (hence reducing food available to those bears) interactions between polar bears and oil-field workers will be more frequent, and more severe. Greater numbers of emaciated bears are likely to threaten workers, and such interactions are more likely to lead to the killing of bears in defense of life and property.

With this population already in severe decline, additional mortalities can only add to declining numbers.

Failure to fully consider complicating factors of climate change—The DEIS repeatedly states that ongoing sea ice loss and other climate change symptoms of global warming will exacerbate impacts of the exploration and development activities that are proposed. Without explanation, however, the DEIS also concludes that impacts still will be negligible. Numbers of polar bears on land and visiting the bone pile at Kaktovik, are almost certain to increase as sea ice continues to decline. Numbers of maternal dens and their importance to population welfare are likely to increase at the same time activities proposed in the DEIS will increasingly impact them. Negative polar bear/human interactions are sure to increase in number, with no serious discussion of how these increasing conflict situations will be handled. Even if mitigation measures applied in the past have been successful, all of these changes mean that challenges will be more difficult in the future, and that severity of outcomes is likely to increase. Despite the fact that uncertainties prevail in strategizing future mitigation measures to handle more frequent and more complicated challenges, the DEIS maintains past practices will keep impacts negligible. In addition to the small number of past deaths recorded in Alaska's oilfields, knowledge of the fate of mother bears and cubs that left dens in oil field areas is absent. When the polar bear population of the Southern Beaufort Sea was thriving, these events may not have been important. Now, every requirement for additional energy expenditure and every additional mortality can accelerate the declining welfare of this population. Although acknowledging these facts, the DEIS offers no remedies, and fails to explain its conclusions in light of those facts.

Not recognizing potential for cumulative effects— Development of the Arctic Refuge Coastal Plain would extend the development corridor on Alaska's North Slope approximately 90 more kilometers to the vicinity of Barter Island. This expansion would mean that essentially half of the Arctic Coast of Alaska has some form of industrial development, and more of the previously pristine coastline that pregnant polar bears visit each autumn would be fragmented by human development. Assessing cumulative impacts is difficult and studies have not been done to estimate whether the expansion of oil-field activity in Alaska may have contributed to trends in polar bear welfare. We do know, however, that polar bears and all animals operate on an energy budget. They are constantly trying to bring in more energy and nutrients than they consume. If successful they increase body mass and females can successfully reproduce. We also know that unnatural and hence unnecessary movements and activities add to the energy costs animals normally face. The greater the number of novel and unnecessary energy expenditures a polar bear needs to make, the greater the likelihood of going into a negative energy balance. Polar bears in the Southern Beaufort Sea are increasingly in negative energy balance, as reflected in declining survival of cubs and reduced population size. Although these negative trends can largely be attributed to warming temperatures and declining sea ice availability, we cannot overlook a possible contribution from the expanding footprint of oil and gas developments in coastal areas of northern Alaska. The negative trends in the Southern Beaufort Sea population have coincided with major expansion of developments. The extra energy polar bears must expend as they encounter foreign objects or activities may not mean much in a stable

environment with healthy bears. With energy balance and reproduction declining, however, potential effects from a 90-kilometer expansion of coastal infrastructure cannot be ignored.

Polar bears are a designated threatened species. The Arctic National Wildlife Refuge Coastal Plain has been designated critical habitat to prevent having on-the-ground activities compound the negative impacts of ongoing habitat loss. If allowed to proceed, the exploration and development of the Arctic Refuge Coastal Plain described in this DEIS will have population level negative effects on polar bears of the Southern Beaufort Sea. Exploration is nearly certain to disturb multiple females from their dens and mortalities of mother bears and their cubs seem virtually assured. Increased numbers of conflicts between humans and the greater numbers of hungrier bears on land are unlikely to be avoided. These conflicts are increasingly likely to result in fatalities as hungry bears become more desperate. The developments and activities proposed in this DEIS are contradictory to the goals for which the Arctic Refuge and the critical habitat it contains were established. Those developments and activities can only worsen the already declining conditions facing polar bears as they go through their normal life cycle, and they are virtually certain to accelerate the ongoing decline in the Southern Beaufort Sea polar bear population. The likelihood of negative population level effects from these combined influences makes it clear that exploration and development of the Arctic National Wildlife Refuge Coastal Plain should not proceed unless and until there are assurances that these negative impacts can be eliminated—not just mitigated.

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