



United States Department of the Interior

U.S. FISH AND WILDLIFE SERVICE

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IN REPLY REFER TO:

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MAR 13 2019

Memorandum

To: Nicole Hayes, Bureau of Land Management, Project Manager Coastal Plain Oil and Gas Leasing Program EIS

From: Regional Director – Alaska Region *Gregory E. Saito*

Subject: Comments on the 2018 Draft Environmental Impact Statement (DEIS) for the Coastal Plain Oil and Gas Leasing Program for the Arctic National Wildlife Refuge, Alaska

The U.S. Fish and Wildlife Service (Service) appreciates the opportunity to review the Bureau of Land Management's (BLM) DEIS for the proposed Coastal Plain Oil and Gas Leasing Program in the Arctic National Wildlife Refuge (Arctic Refuge) for which we are a cooperating agency pursuant to the National Environmental Policy Act (NEPA).

Our comments and recommendations are provided in accordance with the NEPA, Alaska National Interest Lands Conservation Act (ANILCA), National Wildlife Refuge System Administration Act as amended by the National Wildlife Refuge System Improvement Act, Endangered Species Act, Marine Mammal Protection Act, Migratory Bird Treaty Act, Bald and Golden Eagle Protection Act, Fish and Wildlife Coordination Act, Wild and Scenic Rivers Act, and Public Land Order 2214.

For the last year, we have worked with the BLM on development of alternatives to help ensure that all purposes of the Arctic Refuge as outlined in the Public Land Order and ANILCA, as currently amended, are met. The ANILCA purposes are:

- (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;
- (ii) to fulfill the international treaty obligations of the United States with respect to fish and wildlife and their habitats;
- (iii) to provide, in a manner consistent with the purposes set forth in subparagraphs (i) and (ii), the opportunity for continued subsistence uses by local residents;

(iv) to ensure, to the maximum extent practicable and in a manner consistent with the purposes set forth in paragraph (i), water quality and necessary water quantity within the refuge.”; and

(v) to provide for an oil and gas program on the Coastal Plain

The Tax Act of 2017 added the fifth purpose for the Arctic Refuge, and the DEIS examines alternatives for implementing that purpose. The Service is required to manage refuge lands and waters in a way that is consistent with all purposes. To meet this requirement, the consistency of all Alternatives with the other purposes of the Arctic Refuge is important. We believe the DEIS can be improved by a more explicit analysis and comparison of the impact of the alternatives on the achievement of each of the purposes of Arctic Refuge.

Alternative D2 contains the primary elements put forth by the Service during the alternatives workshop for cooperating agencies, and is our preferred alternative for meeting all of the purposes of the Arctic Refuge and best preserving the wilderness characteristics provided for in ANILCA. Alternative D2 also helps ensure management interests and requirements to maintain river values (free flow, water quality, outstandingly remarkable values) and preliminary river classifications of river corridors determined to be suitable additions to the National Wild and Scenic River System (NWSRS) in this area are maintained. Additionally, Alternative D2 is also the most consistent with the Endangered Species Act (ESA), the Marine Mammal Protection Act (MMPA) and bilateral and international agreements. The modifications recommended in the attachment include specific Stipulations (Stips) and Required Operating Procedures (ROPs) that help improve upon the work that has been done.

In order to aid the BLM’s NEPA review process, we provide comments and recommendations that are more detailed in the Attachment. Please accept these review comments in the spirit of improvement. Our comments are organized into three sections:

- Section 1: General Comments;
- Section 2: Comments on Proposed Stipulations and ROPs; and
- Section 3: Specific Comments.

Thank you for your continued coordination. We appreciate and value our cooperating agency status on this project, as the Service has managed the Arctic National Wildlife Refuge and its resources for several decades and has information and expertise that is valuable in formulating a final EIS that can withstand the scrutiny of legal sufficiency. For questions regarding these recommendations please contact our Arctic Science Program Coordinator Dr. Wendy Loya at the Anchorage Regional Office at 907-786-3532 or via e-mail at wendy_loya@fws.gov.

Attachment

U.S. Fish and Wildlife Service Cooperating Agency Review, Arctic National Wildlife Coastal Plain Oil and Gas Leasing Program Draft Environmental Impact Statement

Section 1: General Comments

Many issues identified during scoping have been included in the Draft Environmental Impact Statement (Draft EIS or DEIS), which improves the analysis of potential resource impacts. However, there are several aspects of the analysis that with additional attention can help ensure the adequacy of the final Environmental Impact Statement (EIS). Our key general concerns for the project are described below:

- As the land and surface estate manager, the Service would like the importance of consultation between the BLM Authorized officer and the Service in implementing the oil and gas program to be more explicit when access to the subsurface may affect the surface resources managed by the USFWS. We recommend that relationship be defined in Section 1.7 and throughout Section 2. We suggest the following language: “Where oil and gas program activities may affect surface resources managed by the USFWS, the BLM Authorize officer will consult with the USFWS to reach consensus on decisions. This can include approval of a variety of instruments for activity implementation, including but not limited to plan approval, permits, exceptions, modifications, and waivers.” Additionally, Table 2-2 on page 2-4 should be revised where it states that exceptions could be made by the Authorized Officer to indicate that exceptions would be made by consensus of the BLM Authorizing Officer and the USFWS designated Officer when pertaining to surface resources managed by the USFWS. Consensus would not apply to decisions relating to oil and gas activities that do not affect surface resources managed by the USFWS. We look forward to working together to make this program successful.
- Given the overlap of potential lease blocks and polar bear denning habitat, we recommend ensuring that surveys of polar bear denning habitat are required under all alternatives and development scenarios. We also emphasize that it would be important to ensure that all potential lessees are aware that they will have to consider the need to avoid disturbance of denning polar bears when they consider the temporal and spatial aspects of their operations. The impact of those temporal and spatial considerations on their operations will depend on the degree of overlap of specific lease blocks with denning habitat and the location of detected dens in any given year.
- The analysis and area estimates for 3-D seismic used in the Reasonably Foreseeable Development Scenario are now based on the incorrect assumption that area-wide seismic would occur prior to the Record of Decision. This affects the impact analysis throughout the document. Further, the analysis evaluates the assumption that only about 35% of the project area (900 sq. miles) will be surveyed using 3-D seismic. This estimate originates from typical 3-D survey operations in the NPR-A. However, it is unlikely these efforts are comparable with proposed seismic plans in the project area. For example, Walker et. al (2019) assumed the entire project area would be explored and estimated a total of 37,800 miles of seismic lines could impact an estimated 235 sq. miles with long-term impacts. The document mentions that seismic exploration will be further detailed in the seismic Environmental Analysis, but the assumed timing presented in Table B-3 is highly uncertain. Details and analysis regarding seismic exploration in the program area should be evaluated and revised in this document.
- The introduction overview states that the issuance of an oil and gas lease does not have any direct effects on the environment since it does not authorize drilling, or any other ground disturbing activities; however, a lease does grant the lessee certain rights to drill for and extract oil and gas

subject to reasonable regulation, including applicable laws, terms, conditions and stipulations of the lease. Given our recent experience examining a proposal to conduct seismic operations in the 1002 Coastal Plain, we believe it is important that lessees understand that there may need to be significant temporal and spatial conditions placed on activities that overlap in time and space with polar bear denning habitat. Such conditions are necessary to ensure compliance with the ESA and MMPA. We believe this information should influence BLM's decision of which tracts of land should be offered for lease and the terms and conditions to be applied to such leases and subsequent authorizations for oil and gas activities.

- The DEIS should clarify the criteria used to define the area of high hydrocarbon potential, given that the Tax Act requires that "each sale offer for lease at least 400,000 acres of the highest hydrocarbon potential (HCP) lands within the Coastal Plain." Specifically, it is not clear how the DEIS arrives at delineating an area of moderate potential and how this area meets the high HCP criteria set forth in the Tax Act for lease sales. The USGS resource assessment of the 1002 Area (USGS 1998) delineates only high and low resource potential areas, associated with the deformed and undeformed areas to either side of the Marsh Creek Anticline. According to the values from the USGS reproduced in the Draft EIS as Appendix B Table B-1, nearly 85% of the in-place oil is in the undeformed area and only about 15% is within the deformed area.
- The DEIS could better address strategies to prevent introduction and spread of invasive species. To address invasive terrestrial plants, the Required Operating Procedures (ROPs) should recognize the use of, and include additional information about, certified weed-free gravel and supplies for road corridor construction and pipeline construction. Additionally, the document does not adequately address the threat of introduced aquatic invasive species (e.g., Elodea), invasive terrestrial invertebrates, or invasive terrestrial vertebrates (e.g., rodents). The DEIS should also describe how the proponent will respond to an introduction of nonnative species.
- We recommend adding a ROP under all alternatives the requirement for development of spill response plans. This is currently only found under Stipulation 4, Alternative D, Standard iv. Our recommended standard/requirement is as follows: Operators would be responsible for developing comprehensive spill prevention and response plans, including Oil Discharge Prevention and Contingency Plans and spill prevention, control, and countermeasure plans as well as to maintain adequate oil spill response capability to effectively respond during periods of ice, broken ice, or open water. Plans should be based on the statutes, regulations, and guidelines of the EPA, Alaska Department of Environmental Conservation (ADEC), and the Alaska Oil and Gas Conservation Commission (AOGCC), and well as ROPs, stipulations, and policy guidelines of the BLM and USFWS.
- The effects of a changing arctic environment should be further addressed within the EIS. There is a large body of literature that describes the potential landscape level changes on the North Slope, including changes in permafrost, hydrology, land cover and infrastructure stability. For example, a recent study by Hjort et al. 2018 indicates that the effects of permafrost melt will be an engineering hazard to infrastructure by mid-century. Additionally, there are specific effects related to environmental change such as ice wedge degradation leading to subsidence and changes in hydrology, snow accumulation and plant communities (Jorgenson, M. T., Shur, Y. L., & Pullman, E. R. 2006; Reynolds et al. 2014). Effects of these changes have been shown to be more severe in areas with topographic complexity such as the 1002 coastal plain (Liljedahl et al. 2016). We recommend that studies like these be included in the analysis of potential impacts to various development scenarios. Additional information on this topic can also be found in Jorgenson et al. 2016, Frost et al. 2018 and Kanevskiy et al. 2017.

- The Reasonably Foreseeable Development Scenario and associated analyses used in alternatives development does not provide any differentiation between jobs creation, employment income, revenue to communities or government entities, or recovery/production of oil and gas resources. As such, the assumption is that these factors are held constant regardless of the alternative selected. Therefore, the BLM should primarily base their alternative selection on the differing environmental consequences identified in the analyses under the action alternatives. The Service's preference for Alternative D2 as the Environmentally Preferred Alternative is supported by the requirements and standards provided in the DEIS for stipulations and ROPs.
- The Marsh Fork-Canning, Hulahula, and Kongakut Rivers were found to be eligible and suitable for inclusion in the National Wild and Scenic River System, as noted in the DEIS. All Stipulations and ROPs should strive to not affect the Wild and Scenic characteristics and values of these rivers. We have noted specific suggestions in the sections 2 and 3.
- We recommend including information referred to in other NEPA documents (e.g. Greater Mooses Tooth-2 FEIS, National Petroleum Reserve Area (NPRA) Integrated Activity Plan/EIS) in the appendices so that when information found within these documents is used or referenced within the EIS, it is easily accessible and it is clear what information is being referenced. We also suggest that all references to other regulatory documents include chapter or page numbers to guide the reader to the appropriate information.
- Throughout the DEIS there are requirements that applicants will need to monitor, assess, and evaluate the effects of development activities on the resources of the Arctic Refuge. In all of these instances, the data and analyses should be provided to the USFWS and BLM for their records. Data should be provided in electronic format and be accompanied by complete metadata and information about collection and analysis methodology.
- Arctic Refuge Special Use Permits authorize private businesses to operate commercial hunting, fishing, recreation, polar bear viewing, and general visitor access to the 1002 coastal plain area. All alternatives should address impacts to the operations of these private businesses and their continued viability.

Section 2: Comments on Stipulations and ROPs

Stipulation 1: Rivers and Streams

- In a manner similar to the NPRA FEIS/IAP, we recommend that river setbacks be used to meet the objectives stated in Stipulation 1, which include the other Refuge purposes. Alternative D reflects the Service's recommended minimum of 0.5 mi setback for all identified rivers, while we also identified greater setbacks for larger rivers, which we believe are necessary and appropriate to protect the other purposes of the Refuge as well as Wild and Scenic River values. The recommendations are similar to setbacks used for important habitat and subsistence-use rivers and riparian areas in NPRA. Exact setback distances necessary to meet the objectives could be refined by further quantitative analyses of viewshed, soundscape and the Reasonably Foreseeable Development Scenario. Overlaying river setbacks on the viewshed study submitted by TrueNorth GIS suggests that Alternative D would minimize impacts on approximately 25% more land through NSO than the other alternatives, better protecting the species, habitats and activities identified in the Refuge purposes while allowing for oil and gas development through full access to hydrocarbons through subsurface leasing. We recommend that all rivers have minimum setbacks of 0.5 mi under Alternatives B and C to meet other Refuge purposes, except for spring-fed rivers, which should have minimum setbacks of 1 mile to protect these important, unique habitat features. We believe this change is necessary to ensure that Alternatives B and C are compatible with the purposes of the Arctic Refuge as stated in ANILCA.
- Analysis by Service staff, using available viewshed information conducted by True North GIS and submitted to the BLM for consideration in the DEIS, shows most infrastructure with a maximum of 15m height would be visible if built within any of the setbacks for the six rivers as described currently in Alternatives B-D. Our analysis shows Alternative D (with approximately 750 km of the Coastal Plain protected by NSO setbacks on the six named rivers) provides complete viewshed protections for just under 12% of the project area (where infrastructure of any height would otherwise be visible from the rivers). Further, an additional 23% of the viewsheds from these six river corridors are protected when infrastructure is modeled to be at or below 15m in height, as specified in Alternative D. (see personal communication Paul Leonard, "Re-analysis of Viewshed Modelling for the Arctic Refuge's Coastal Plain Major Rivers.")
- Given the high use of the Coastal Plain for denning by polar bears, especially when compared to the rest of northern Alaska, ensuring bears have access to preferred areas of denning habitat is important. This is highlighted by the fact that terrestrial denning is likely to continue increasing as sea ice conditions deteriorate further in future years. While Alternatives B and C provide some protection of high use polar bear denning habitat under Lease Stipulation 1, there are large areas where numerous polar bears dens have been recorded (Map 3-24) that do not have restrictions on surface occupancy under these alternatives. Even if surveys were conducted under MMPA Incidental Take Regulations with the intention of reducing the potential to disturb denning bears in those areas, Incidental Take Regulations (and hence Stipulation 5 for Alts B and C) would offer no protections against behavioral avoidance of those areas once developed. This could effectively lead to a loss of preferred denning habitat. Stipulation 1 under Alternative D protects a much broader area of important, and highly used denning habitat than the other alternatives, especially in the central portion of the Coastal Plain. We believe application of this Stipulation across alternatives B and C would be more consistent with all of the purposes of the Arctic Refuge, the MMPA and BLM's responsibility under Section 7(a)(1) of the ESA.
- We recommend that appropriate Stipulations and ROPs to minimize impacts to Wild and Scenic River characteristics (e.g., maintaining water quality, free-flowing condition, identified

Outstandingly Remarkable Values (ORVs), and wild classifications) be applied whenever activities may affect a river's Wild and Scenic River characteristics.

- Requirement/standard(s) should be added that prohibits infrastructure within maximum perceptible visible distances (e.g: how far an individual person would be able to see from any place inside a river buffer); or above heights that an individual person (spatially) is likely to be able see. Additional analysis should be completed to determine the area extent of the infrastructure prohibitions/height limitations.
- Protecting natural quiet (as well as natural sounds and noise) is inherent to preserving river values for suitable rivers classified as wild and possessing recreational and cultural ORVs. We recommend that Requirement/Standard(s) should be added across alternatives B-D that provides acoustic protections for natural quiet from within suitable river corridors.
- We recommend adding a Requirement/Standard(s) under Oil and Gas Field Abandonment, across alternatives B-D that specifies all eligibility findings and suitability factors as specified in the Arctic Refuge wild and scenic river review should be restored to a point where the area is again qualified for inclusion in the National Wild and Scenic River System.
- We recommend adding an additional Requirement/Standard(s) that reads: Before activities affecting suitable Wild and Scenic river corridors can occur, collection of baseline data that documents current suitable river characteristics will be completed as prescribed by the Authorizing Officer and in consensus with the USFWS as the surface management agency. This information will be used to monitor impacts, detect when National Wild and Scenic River System values are threatened, and identify needs for changes in practices. The lessee is to provide support for these efforts to help monitor and analyze effects on suitable river values and wild classification.
- The Requirement/Standard(s) should be designed to specifically maintain characteristics of the recreation and scenic ORVs for the Kongakut River, even though it is outside the project area. GIS modeling should be completed to determine whether/to what extent a setback within the eastern boundary of the project area would be needed to maintain viewshed characteristics of the scenic ORV for the Kongakut River.
- Alternatives B-D prohibit permanent oil and gas facilities (gravel pads, roads, airstrips, pipelines) within certain river corridors; and on a case-by-case basis allow pipeline and road crossings deemed essential to cross through setbacks. This threatens the tentative wild classification of suitable rivers. We recommend changing requirement/standard wording for and the HulaHula river under all alternatives to include the following language: "(NSO) No permanent oil and gas facilities are allowed in the streambed and within the setback distances to protect Wild and Scenic River characteristics." Alternatives B-D seek to "minimize the disruption of free flow" but language should specify that *maintaining* free flow is required to meet Service interim management requirements for suitable rivers.
- Preservation of recreational hunting, fishing, hiking and boating values and opportunities is an original purpose of the Arctic Refuge, and the majority of visitors recreate within the project area. In order to meet the original purpose of this area, an objective for Alternatives B and C should be to minimize impacts on recreation.
- The Canning, Marsh Fork-Canning (main tributary of the Canning), Hulahula, and Kongakut Rivers are highly valued and/or used by the public for recreation. The objective of this stipulation should include preservation of Recreational Outstandingly Remarkable Values as described for the Marsh

Fork-Canning, Hulahula and Kongakut Rivers, and include requirement/standards consistent with USFWS interim management prescriptions for suitable rivers.

- We recommend deleting the last sentence in the objective “Protect the water quality, quantity....across the coastal plain”, and include “springs and aufeis” in the first sentence following “riparian areas”.
- While Sadlerochit Springs appears to be within the Sadlerochit River, it is actually west of the Sadlerochit River and is a tributary to the Itkilyariak River. We recommend that Sadlerochit Springs and Creek, and Itkilyariak Creek-complex have a 3-mile setback in all alternatives in Leasing Stipulation 1 due to its cultural significance and unique terrestrial and aquatic communities. The Sadlerochit Spring Creek and Itkilyariak Creek complex have a unique endemic population of dwarf Dolly Varden and is an important subsistence use area. For more information see Arctic Refuge CCP (2015).
- To meet the objective for Stipulation 1 and meet the other identified Refuge purposes, gravel mining sites should not be allowed in areas designated No Surface Occupancy.
- It is difficult to address the adequacy of a standard that allows case-by-case approvals for development in nearshore waters when the objective is to protect habitat. The standard's adequacy will remain unknown until we know more about what will be approved and how those developments will fare over time. The standard states "exploratory drill pads, production pads, or CPFs are not allowed unless they're approved" which imparts significant subjectivity. We recommend the EIS provide additional clarity on how case-by-case approvals may occur and how they will be decided. Additionally, we recommend including a requirement that approvals will be reached by consensus between the BLM Administrative Officer and an authorized Service representative.

Stipulation 2: Canning River Delta and Lakes

- Water resources in the Canning River Delta, including lakes, represent some of the highest quality wetland habitat within the Refuge. Unlike the coastal plain ecosystems to the west of the Refuge, the Refuge Coastal Plain has considerably fewer lakes. Therefore, lakes in the Canning River delta provide important habitat for fish and waterbirds that is not widespread in the project area. Protection of these habitats from disturbance is required to conserve fish and wildlife populations and habitats in their natural diversity and ensure water quality and quantity within the refuge is maintained. We previously recommended No Surface Occupancy be allowed in this area except for essential infrastructure approved by the BLM and with consensus from the Service. This requirement is currently supported in Alternative D, and should be applied to alternatives B and C to help maintain the other ANILCA purposes of the Refuge.

Stipulation 3: Springs/Aufeis

- We recommend adding NSO buffers and no lease setbacks as described in Alternative D to all alternatives. Alternatives B and C may not meet the other purposes of the Refuge without this requirement, including significant impacts to fish and wildlife populations and habitats in their natural diversity, the opportunity for continued subsistence uses, and water quality and quantity. Rivers in the Arctic Refuge with perennial springs support fish during the harsh winters, and rivers without springs have no fish. All Arctic Grayling and Dolly Varden are major subsistence resources in the Arctic Refuge, and their survival depends on approximately twenty springs found within the coastal plain and adjacent foothills, thus they are truly critical habitats. Only four rivers that cross the 1002 Area support major anadromous or endemic fish populations, requiring special recognition.

Subsurface flow paths to perennial springs are unknown and could potentially be disturbed by drilling or fracking activity. This universal stipulation is needed to ensure that these important and unique habitats and water resources are protected per ANILCA purposes of the Refuge, while accounting for uncertainty regarding sources and flowpaths of groundwater in the Coastal Plain.

- Specific protective setback distances from springs and aufeis should exist, but not be defined until studies of spring flows and sources are completed, as flow to springs may originate outside of a 3-mile setback. Flows to springs likely traverse or originate in groundwater beneath permafrost; this groundwater is identified as the recipient water body for potentially toxic drilling wastes via injection wells. Studies of springwater flows, including sources, should accurately identify and delineate surface water and groundwater flow to and from springs; these flow patterns may be linear (channels) or large areas (aquifers) that require differently shaped buffers. Delineating specific protective buffers prior to these studies are completed may result in buffers that are insufficient to protect these important aquatic habitats. To help ensure the other purposes of the refuge are met, we recommend that the Requirement/Standard for Stipulation 3 be changed under all alternatives to: "Before exploratory or production drilling, the lessee/operator/owner would conduct studies to ensure drilling would not disrupt flow to or from, and waste injection wells will not contaminate any perennial springs. Study plans would be developed in consultation with the BLM, USFWS, and other agencies, as appropriate." Under all alternatives, the following phrase should be added after all delineated buffers referring to "above" springs: "or to a distance that sufficiently protects groundwater sources and flows of (the named spring), whichever is greater."

Stipulation 4: Nearshore Marine, Lagoon, and Barrier Island Habitats of the Southern Beaufort Sea within the Boundary of the Arctic Refuge (Map 2-2 and Map 2-4)

- Due to the abundance, diversity and accessibility of subsistence resources in the nearshore area, this zone is a significant subsistence hunting area. Alternative D requirements to coordinate with local users represents best-practices developed for NPRA and the Chukchi Sea leasing programs and should be applied consistently when subsistence resources may be impacted.
- As polar bear use of the onshore environment increases in summer/autumn due to sea ice loss, it will become increasingly important to reduce human-polar bear conflict, ultimately leading to reductions in polar bears killed in defense of life. While all alternatives provide good protections for polar bears on barrier islands, Alternatives B and C are insufficient to minimize human/bear conflict when bears are active on the mainland coast. Bears move up and down the coastline during summer and autumn as they search for beach-cast marine mammal carcasses or subsistence whale remains. As such, the coastline provides an important movement corridor and habitat for resting for bears during summer and autumn. Alternatives B and C do not provide temporal restrictions on activities which could lead to unnecessary conflict with polar bears. Alternative D restricts activities in this area to the time of year when polar bears are less likely to be moving along the coast, thus providing a good mechanism for reducing conflicts, and potential lethal removal of bears. We recommend that the requirements/standards from D be applied across all alternatives to ensure requirements of the MMPA and ESA are met.
- We recommend altering the Objective in this stipulation to better describe the diversity of avian species. 'Waterfowl' is used, but should be 'waterbirds', and include 'sea birds and larids', since larids and seabirds are not covered by definition of 'waterbirds' on p. 3-86, or in Table J-9. Please change to "Objective: Protect fish and wildlife habitat, including that for waterbirds, larids, sea birds, and shorebirds, caribou insect relief"

Stipulation 5: Coastal Polar Bear Denning River Habitat

- Alternatives B and C do not provide protections for the possible behavioral avoidance of important polar bear denning habitat even with a small development footprint. Alternative D allows polar bears unhindered access to large areas of their preferred denning areas in the Coastal Plain. This will become increasingly important as the density of land-based dens increases in future years due to sea ice loss. We recommend that the requirements/standards from Alternative D be applied to Alternatives B and C. This would be most consistent with the Refuge purposes as outlined in ANILCA, the ESA and the MMPA.
- The language in Alternative D, Requirements/Standard subparts (a) and (b) allow the BLM Authorizing Officer to approve alternative protective measures. We recommend any such approvals be granted only in the case of consensus by the Service, given the need to ensure compliance with the ESA and MMPA.
- Changes in denning and/or disturbance should be monitored and evaluated over time. We recommend adding a requirement that a study of a minimum of 5 years be conducted to detect polar bear dens in all active lease blocks that overlap with polar bear designated critical habitat. If changes and/or disturbance are identified, then corrective measures may be applied.

Stipulation 6: Caribou Summer Habitat

- As shown in Maps 3-21 and 3-22, the entire Coastal Plain of the Refuge is high value caribou calving and/or insect relief habitat used by the Porcupine and Central Arctic herds. Female caribou with calves are sensitive to disturbance during the summer periods when they inhabit the coastal plain. We recommended timing limitations described under Alternative D in order to minimize impacts on this internationally important herd and subsistence resource. Importantly, Alternative D2 allows for exceptions to the timing limitations if approved by the Authorized Officer in consensus with the Service as the surface management agency, to account for variability in herd distribution. Recognizing the uncertainty about how much development will occur when and where, Alternative D2 provides managers with the ability to regulate development activity if needed.
- Recommend ROP be revised as: "Objective: Reduce disturbance of caribou and hindrance or alteration of caribou movements during periods when caribou are sensitive to disturbance."
- Recommend that the monitoring plan required in Requirement/Standard "g." in ROP 23 be expanded beyond vehicle use management to all potential activities that may disrupt caribou, and that allows for adaptive management to ensure ROP 23 is effective.

Stipulation 7: Porcupine Caribou Primary Calving Habitat Area (Map 2-2)

- A significant number of scoping comments called for protection of the Porcupine Caribou herd calving grounds, as has been done for the Teshekpuk and Western Arctic herds in NPRA. In the absence of delineated Special Areas identified for NPRA, the Draft EIS uses high density calving habitat to delineate the area where disturbance should be minimized during calving. Requirements found in Alternative D are designed to minimize impacts on caribou and their calves and protect the spring and fall primary migration corridor for the entire herd. The No Leasing restrictions occur in the area of lowest resource potential, while still allowing sufficient acreage to meet the requirements of PL 115-97. The timing limitations under Alternative B to minimize construction activity during the calving period would only be effective during the 1-2 years of an individual well pad construction, but would not minimize disturbance during exploration or during 30+ years of

operations. Alternative C would allow for exploration, which includes disturbance during summer for studies, “stick-picking” and other activities.

- Recommend that the “Note” in this section be reworded as: “For the purposes of this document, the Porcupine Caribou Herd (PCH) primary calving habitat area was defined as the area with a higher-than-average density of cows about to give birth during more than 40 percent of the years surveyed. It is recognized that locations of important calving areas may shift over time; thus, this definition will require continued assessment and possible revision.”
- Recommend revision of the Objective for this stipulation to: “Reduce the possibility of disturbance of caribou or hindrance or alteration of their movements in the south-southeast portion of the Coastal Plain, which has been identified as important caribou calving habitat during many years.”
- Recommend that the monitoring plan required in Requirement/Standard “a.i.” be expanded beyond vehicle use management to all potential activities that may disrupt caribou, and that allows for adaptive management to ensure Lease Stipulation 7 is effective.

Stipulation 8: Porcupine Caribou Post-Calving Habitat Area

- Because of the level of activity, noise and larger footprint associated with Central Processing Facilities, we recommended that they be prohibited from the lands identified as calving and post-calving habitat in Maps 3-22 and 3-23 for the PCH and Central Arctic Herd (CAH), as described in Alternative D. The footprint limits recommended in Alternative D are intended to avoid high-density infrastructure in this area and ensure that caribou can move freely and undisturbed through the area per the requirements of ROP 23.
- Recommend revision: “Note: For the purposes of this document, the PCH post-calving area was defined as the area with a higher-than-average density of cows during the post-calving period for more than 40 percent of the years studied. This includes and extends beyond the primary calving area. It is recognized that locations of important post-calving areas may shift over time; thus, this definition will require continued assessment and possible revision.”
- Recommend the following revision of the Objective for this stipulation: “To protect key surface resources and subsistence resources/activities from disturbance resulting from permanent oil and gas development and associated activities in areas used by caribou during post-calving and insect-relief periods.”

Stipulation 9: Coastal Area (Map 2-2)

- Recommend revising the Requirement Standard under Alternative B as follows: “...lessee/operator/contractor would develop and implement a *Service-approved Polar Bear* impact and conflict avoidance and monitoring plan.”
- While an impact and conflict avoidance plan as identified in Requirement/Standard of Alternative B would help reduce conflict with polar bears, it is an insufficient protection for bears on shore in summer and autumn for the following reasons:
 - It would not account for the potential behavioral avoidance of polar bears seeking maternal denning habitat.
 - While polar bears have been observed traversing oil facilities along the coast during summer/autumn, by not restricting infrastructure along the coast, there is an increased risk of human-polar bear conflict that could lead to more bears being killed in defense of life, or that come into contact with hazardous materials.

We are concerned that under Alternative B we could not successfully manage human-polar bear conflicts and ensure compliance with the MMPA and ESA, as Alternative B does not provide sufficient protections for polar bear coastal habitat. Alternative C begins to make meaningful progress towards minimizing effects to coastal denning habitat and reducing the probability of human-polar bear conflict. However, we recommend the protections for polar bears and their habitat as outlined in Alternative D be adopted to help ensure compliance with MMPA and ESA.

Stipulation 10: Wilderness Boundary

- In the absence of quantitative information during the week of alternatives development, the Service recommended that a 3 mile NSO setback be stipulated in order to provide access for subsurface oil and gas utilizing current drilling technology and an element of conserving wilderness values along the northern edge of the Mollie Beattie Wilderness Area. This setback will help keep visual and acoustic disturbance associated with oil and gas exploration and development at a minimum. The recommended 3 mile buffer was based off the minimum distance from the Northstar facility at which in-air sounds dropped below ambient noise levels (USACE 2012). Thus, the Service supports Alternative D or a setback distance appropriate to meet the objective as determined by further quantitative analyses of the viewshed, soundscape and Reasonably Foreseeable Development Scenario.

ROP 1:

- To meet all purposes of the Refuge, the Requirement/Standard for this ROP should read: "Areas of operation would be left clean of all debris, residual soil contamination, surface water contamination, and groundwater contamination where groundwater is hydrologically connected to springs."

ROP 2:

- Recommend adjusting the wording in the Requirement /Standard as follows:
 - The plan would be submitted to the BLM Authorized Officer ~~for approval~~, in consultation with federal, State, and NSB regulatory and resource agencies *for approval*, as appropriate.
 - b. Lessees/operators/contractors would have *an approved* a written procedure.
 - c. To protect the water quality standard inherent to the wild river classification, add: "i. within setbacks for all suitable rivers, no pumpable, solid, liquid, and sludge waste shall be disposed of by injection (as is the standard elsewhere). Rather, ADEC approved storage for backhaul shall be the standard method for disposal of pumpable waste products."
- Under disposal of rotting waste (b), recommend requiring exclusionary devices (e.g., grating, mesh, fence) be installed at all incineration sites to preclude access by wildlife.

ROP 3:

- Recommended revision: The BLM Authorized Officer may allow storage and operations at areas closer than the stated distances if properly designed *and contained* to account for local hydrologic conditions.
- Under all alternatives, recommend adding language to the Requirement/Standard that requires secondary containment and spill response equipment for all fuel equipment and caches.

- For Alternatives B-D: To protect the water quality standard inherent to the wild river classification, recommend inserting a Requirement/Standard specific to suitable rivers: “Refueling equipment within setbacks for all suitable rivers is prohibited. Fuel storage stations would be located outside the setbacks except for small caches (up to 210 gallons) for motor boats, float planes, and ski planes, and for small equipment such as portable generators and water pumps, which would be located at least 100 feet from the active floodplain of suitable rivers.”

ROP 5:

- The Requirements/Standard section under ROP 6 should be moved in its entirety to ROP 5 and added to the current ROP 5 Requirement/Standard.

ROP 6:

- Consistent with the mandate for habitat protection within the project area(s), environmental damage and unnecessary or undue degradation of the lands should be avoided and minimized to the greatest extent practicable, including that which may be caused by vehicular traffic.
- Paragraphs “b.” and “e.”: In order to determine air impacts to the Arctic National Wildlife Refuge, we recommend adding “and Class II” after Class I areas.
- Paragraph “g.”: Ambient monitoring data can be used to determine impacts to Air Quality Related Values (AQRVs). This paragraph should include the following language: “or shows impacts above specific levels of concern for AQRVs”.

ROP 8:

- This Requirement/Standard as currently worded does not meet the stated Objective or ANILCA purposes for the refuge. We recommend editing the objective to read: “In flowing waters (rivers, streams and springs) ensure water of sufficient quality and quantity to conserve fish, waterbirds, and wildlife populations and habitats in their natural diversity.”
- While the requirements should meet Alaska DNR guidelines for temporary water withdrawals, the unique presence of springs within the coastal plain warrants inclusion in the protections. Thus, we recommend the Requirement/Standard be edited to read:
 - a. Withdrawal of unfrozen water from springs, rivers and streams during winter (onset of freeze-up to break-up) is prohibited. The removal of ice aggregate from grounded areas 4 feet deep or less may be authorized from rivers on a site-specific basis.
 - b. Water withdrawal is prohibited year round from the following rivers, streams and springs: Canning, Hulahula, and Sadlerochit rivers including Itkilyariak Creek, a tributary of the Sadlerochit River that drains the Sadlerochit Spring, and perennial springs on the Tamayariak, Sadlerochit (the spring is located just west of the main stem in a tributary of the Sadlerochit River), Fishhole 1 Spring on the Hulahula River, and the perennial spring on the Okerokovik River, which is a tributary to the Jago River.
 - c. Water withdrawal from other rivers and streams, outside of the winter, may be approved by the BLM Authorized Officer, in consensus with the USFWS, with adequate protection of hydrologic regimes, water quality and fish and wildlife habitats and populations.”
- We recommend the ROP identify who will monitor these requirements/standards and how the operator will determine the best approach to achieve required percentages and depths.

ROP 9:

- Recommend providing additional explanation in the body of the document as to how water withdrawal amounts were determined within the Requirement/Standard and whether these withdrawal amounts ensure water volumes will remain sufficient to support fish communities found within the affected water bodies.
- We recommend adding the following requirement to this ROP as it currently does not contain requirements for determining fish presence prior to activities that could impact fish: "Sensitive and non-sensitive fish species will be assumed to be present until surveys with 95% detection probability have been conducted during the appropriate seasons."
- We recommend adding the phrase "connectivity to adjacent bird nesting sites" under the Requirement/Standard. Additionally, we recommend changing the rest of the Requirement/Standard to read: "Withdrawal of unfrozen water from lakes and the removal of ice aggregate from grounded areas 4 feet deep or less during winter and withdrawal of water from lakes during the summer may be authorized on a site-specific basis, depending on water volume and depth, the fish community, and connectivity to other lakes or streams and adjacent bird nesting sites."
- Under Alternative D: This ROP is applicable to all birds. Please change "Additional modeling and monitoring of lake recharge may be required to ensure natural hydrologic regime, water quality, and aquatic habitat for migratory birds" to "Additional modeling and monitoring of lake recharge may be required to ensure natural hydrologic regime, water quality, and aquatic habitat for birds."

ROP 10:

- This ROP currently states that these restrictions do not apply to the use of equipment on ice roads after they are constructed. This is inconsistent with the language below and also with standards promulgated in ITRs for polar bears. If an ice road is constructed and a polar bear den is later detected within 1 mile of it, industry will likely have to reroute the road. While it is true that ITRs will likely have requirements about detecting dens, this ROP does not provide enough detail on how dens will be detected. Without a survey, there would be no known dens, and therefore no need to modify activity. Section b under Alternative D should be included in Alternatives B and C as well, given there is a requirement that all known dens be avoided and surveys are necessary to locate dens.
- Recommend modifying the date range in Section b to end on April 18th, as this is the upper tail of den emergence for land-based denning for bears in the Southern Beaufort Sea as calculated from data published in Rode et al. (2018) and summarized in USGS Alaska Science Center, Polar Bear Research Program (2018). The text should clarify that if an aerial infrared survey is to be conducted, it should be conducted between December 15 and January 31 of any given year.
- Requirement/standard (a) states that use of vehicles and other equipment is prohibited within 0.5 miles of grizzly bear dens identified by ADFG, however ADFG does not currently identify grizzly bear dens in the Refuge. Revise this to state that grizzly bear dens will be identified by the Service, and if the data are not available then the lessee will work with the Service to develop or conduct studies to model habitat use (including denning, foraging and travel) by grizzlies in and around 1002.

ROP 11:

- The program area is steeper, more incised, and includes more river systems compared to flat areas in NPRA where extensive 3D-seismic surveys have been conducted. Topography strongly affects snow, hydrology and permafrost regimes of this generally hilly region and increases the potential for

significant impacts to vegetation. Detailed microtopographic transects across existing 3D seismic trails show that there is compression of the tundra vegetation mat that is up to 20 cm in depth. These changes to microtopography within the track cause other changes to snow, hydrology, and thermal regimes, which make the tracks visible from the air and create conditions in some areas favorable to thermokarst and thermal erosion. Changes in the microtopography and compression of the vegetation mat also would have likely consequences to habitats of many species of plants, insects, small mammals, and birds (Walker et al. 2019). In order to minimize these effects, we suggest the following:

- For Alternatives B-D, change requirement/standard h. to "...overland travel *will* be monitored, and the operator will accommodate representative(s) during operations."
- In Alternatives B-D, recommend including the requirement for the operator to submit a snow monitoring plan that outlines measurement protocols (occurring before and during winter tundra travel) to be submitted to BLM and USFWS for review prior to work being conducted, to ensure habitat impacts are minimized. Protocols should include field measurements accounting for snow depth and density at sites on the Coastal Plain, and should represent the topographic diversity (e.g. terrain ruggedness, elevation, landforms, latitude and longitude) of the project area. Existing protocols used by the State of Alaska Department of Natural Resources (DNR) for the central Arctic, such as described in Derry et al. 2009 or newer may be useful.
- Under Requirement/Standard "a," all Alternatives, indicate that the exact dates are determined annually and recommend removing the approximate dates given the differences in snow depth and distribution for the Arctic Refuge Coastal Plain compared to the central Arctic and the trend towards decreasing snow cover season over time.
- Change Requirement/Standard "b," second sentence, under all Alternatives to read: "These vehicles would be selected and operated in a manner that eliminates direct impacts on the tundra *caused by* shearing, scraping,"
- Alternative D (standard a) mentions measurements should be made "over the highest tussocks". No features are mentioned in alternatives A-C leaving the question open from where measurements can originate. Suggest standardizing across alternatives (e.g., above tussock tops) and in a manner consistent with DNR measurement protocols.
- Recommend adding that pre-packing with appropriate low-pressure ground vehicles to achieve required depth x density requirements may be required in tussock tundra and other sensitive vegetation types.

ROP 15:

- The Requirement/Standard listed here may be conflicting with ROP 11, standard G. We recommend reviewing these two requirements for compatibility.

ROP 16:

- High levels of biodiversity are typically found within river corridors due the topographic gradient and associated vegetation diversity. Thus, to meet the purposes of the Refuge to conserve fish and wildlife populations and habitats, as well as provide continued subsistence access to these resources and ensure water quality and quantity, we recommend that the objective be revised to "Protect water quality and quantity in rivers and streams and minimize alteration of riparian habitat." Subsequently, the requirement/standard could be revised to state "Exploratory drilling is prohibited

in rivers, streams and other water bodies.” No exceptions need to be allowed at this time, as it is our understanding that it is not typical industry practice to drill in rivers or other waterbodies.

ROP 19:

- Recommend changing the Requirement/Standard “a”. to read: “...unless further setbacks are stipulated under lease stipulations 1, 2, and 3.”
- Requirement/Standard “a.” and “c.”: Alternatives B-D allow for non-permanent oil and gas facilities (gravel pads, roads, airstrips, pipelines), and on a case-by-case basis allow pipeline and road crossings deemed essential to cross through setbacks. This threatens the tentative wild classification of suitable rivers. We recommend changing the Requirement/Standard wording to: “(NSO) No permanent oil and gas facilities are allowed in the streambed and within the setback distances outlined to protect Wild and Scenic River characteristics.”
- Recommend changing the Requirement/Standard “c.” to read, “Siting temporary winter exploration and construction camps on river sand and gravel bars is allowed and encouraged, *except on suitable river setbacks.*”

ROP 21:

- For any gravel-related work, where that gravel is brought in from off the Refuge, we recommend a condition requiring the use of Certified Weed-Free Gravel to lessen chances of introducing invasive plants.
- Recommend editing “e.” to read, “Using approved impermeable liners under gravel infrastructure to minimize the potential for hydrocarbon and other hazardous materials spills to migrate to underlying ground or adjacent water resources.”
- In order to address the topography/gradient difference of the Arctic Refuge as compared to the NPRA, we recommend adding the following: “j. Facilities and infrastructure will be designed to minimize alteration of sheetflow/overland flow.”

ROP 22:

- Recommend the following changes to the Requirement/Standard:
 - a. To allow for sheet flow and floodplain dynamics and to ensure passage of fish and other organisms, *single* span bridges are preferred.....
 - Add “d. Facilities and infrastructure will be designed to minimize alteration of sheetflow/overland flow.”
 - Add the following to requirements: e) we recommend adequate data on stream flow, seasonal patterns in lake connectivity, and sheet flow be collected prior to planning bridges and culverts. Data will be stored in a centralized database and available to the general public.

ROP 23:

- These recommendations were developed for the Central Arctic Caribou Herd . Given the differences in herd and range characteristics, they may or may not be appropriate or effective at mitigating impacts to the Porcupine Caribou Herd. We recommend that the monitoring plan noted in

Requirement/Standard “g.” be expanded beyond vehicle use management to monitor the effectiveness of these requirements on the PCH. The plan should allow for adaptive management to ensure effectiveness.

- We recommend approval on the adequacy of any caribou studies be granted only in the case of consensus by the Service and in consultation with the Porcupine Caribou Management Board. Additionally, we recommend that any development proposal should include studies of caribou movements before, during and after completion.

ROP 24:

- For Alternatives B and C, in Requirement/Standard, suggest deleting “c. Potential use of the site for enhancing fish and wildlife habitat.” It may be that fish will eventually find gravel pit water reservoirs and use them, but it would not be in keeping with Refuge purposes to promote this. Additionally, any impoundments affecting suitable rivers would threaten the interim management responsibilities of the Service to maintain free-flowing condition.
- Requirement/Standard “a” in Alternative D should be modified to read “...floodplains of the three rivers...” and remove the Aichilik River from the list of major fish bearing rivers because it is outside of the 1002 Area.
- Requirement/Standard “a.”: Alternatives B-C: Recommend changing gravel mine site language to “Locate outside the active floodplain; *except where further setbacks are stipulated under Lease Stipulation 1.*” Alternative D: insert additional requirement: “Construction of gravel mine sites or water reservoirs may not be considered within the setbacks stipulated for suitable rivers under Lease Stipulation 1.”
- In order to promote development of mining restoration plans (see 2003 NRC report, Cumulative Environmental Effects of Oil and Gas Activities on Alaska's North Slope (2003), we recommend adding the following requirement to each alternative: “Each proposed mine site shall have a Service-approved restoration plan and effectiveness monitoring plan prior to site approval and construction.”

ROP 25:

- Recommend adding that the Service be involved in the development and approval of a plan to help prevent facilities from providing nesting, denning, or shelter sites for ravens, raptors, and foxes as well as assist in monitoring during on-going activities.
- Recommend correcting the language in the Objective. Change “...populations of ground-nesting birds” to, “populations on ground-nesting birds.”

ROP 27:

- The Service recommends the use of lattice towers and avoidance of guy wires which pose a significant collision risk for birds.
- Page 2-29 ROP: Under Requirement/Standard: The Avian Power Line Interaction Committee (APLIC) produced a document in 2012 with guidance for reducing bird collisions with power lines. We recommend the Requirement/Standard include complying with the most up-to-date, suggested practices as published in the 2012 APLIC document, “Reducing Avian Collisions With Power Lines: The State Of The Art In 2012” and future updates to this guidance to minimize collisions and subsequent unauthorized take of eagles, other protected species, and birds in general.

- Under Requirement/Standard: If exceptions are granted to the requirement/standard, wires would pose a risk to birds, but mitigation measures are available. Recommend changing the language in this section read: "If exceptions are granted allowing overhead wires, overhead wires would be clearly marked along their entire length to improve visibility to low-flying birds. Such markings would be developed through consultation with the USFWS", after items "i." through "iii."

ROP 28:

- Current plans for developing an Ecological map does not specify including information on habitat needs of priority birds and mammals to help determine beforehand which land is most likely important for these animals. Information currently available on habitat suitability should be part of the ecological mapping process. Further, more than one year of surveys may be needed to understand wildlife values, particularly for species showing large variation in numbers from year to year (e.g., opportunistic shorebirds such as pectoral sandpipers, red and red-necked phalaropes, buff-breasted sandpipers). Thus, we recommend the requirement be revised to state: "The map would be prepared in time to plan an adequate number of seasons of ground-based wildlife surveys needed to characterize habitat suitability."
- The proposed "*ecological land classification map of the area*" would likely not be able to address the stated objective. We recommend the development of a database, map, and models of likelihood of use need for targeted species within the program area.
- The requirement should include cooperation with the Service to assess the information necessary for planning of ground-based wildlife surveys.

ROP 29:

- Recommend adding to Requirement/Standard: "Cultural Outstandingly Remarkable Values as described for the Hulahula River shall be maintained."
- Recommend including the following language, "If the Permittee discovers any historic, prehistoric, or archaeological sites or artifacts during the course of field operations, all activity at that site shall cease and the State Historic Preservation Office in conjunction with BLM and USFWS shall be contacted immediately but not more than 24 hours after the incident occurs."

ROP 30:

- Under Requirement/Standard: Activities associated with removal of less than 100 cubic yards of bedrock outcrops, sand or gravel from cliffs also have potential to result in raptor mortality and nest/territory abandonment (all of which are prohibited under the Bald and Golden Eagle Protection Act). To avoid unauthorized take of these protected species, project proponents must consult with the Migratory Bird Management Permit Office prior to conducting these activities. The presence of nests may not preclude the work, but an Eagle or Eagle Nest Take Permit may be required before work commences to avoid unauthorized eagle take. Please add a statement that lessee/operator/contractor will consult with the USFWS Migratory Bird Management Permit Office prior to conducting activities that disturb potential eagle habitat.
- Please use metric units in this ROP (e.g. 200 meters rather than 656 feet). This change will ensure consistency and reduce confusion.

ROP 33:

- In order to monitor and assess impacts of construction on wildlife movements, we recommend adding that the lessee may need to support studies and monitoring efforts in addition to providing information on locations of new infrastructure.

ROP 34:

- We recommend adding a Requirement/Standard to address aircraft associated disturbance to denning polar bears, as well as polar bears active on the land during summer and autumn. Minimum altitudes for aircraft should be 1,500 feet above ground level (except for takeoffs and landings). This requirement should be applied to all alternatives to ensure requirements under MMPA and ESA are met.
- Under Requirement/Standard, Effects of low-flying aircraft on wildlife: To avoid unauthorized take (including disturbance) of eagles, aircrafts operating within 0.5 mile of any eagle nest should be prohibited below 1,500' regardless of nest substrate. As currently written, the ROP only precludes aircraft activity around nests on cliff substrates. Protected nests may be located on almost any substrate type including the ground (e.g. owls) or in trees (e.g. bald eagle). Any eagle disturbance regardless of activity type (including takeoffs and landings), is prohibited by federal law without a USFWS Eagle or Eagle Nest Take Permit.

ROP 35:

- The lack of adequate restoration plans and adequate bonds to cover reclamation of areas impacted by oil and gas development on the North Slope is a concern as highlighted in the 2003 NRC report, Cumulative Environmental Effects of Oil and Gas Activities on Alaska's North Slope (2003). Restoration standards should be set in stipulations in this EIS. It should also be clearly stated what level of restoration will be required before land is no longer considered part of the infrastructure development cap. We also suggest that the EIS include a description of the process that will be used to approve restoration and ultimately remove these acres from the cap. Restoration plans should be required and reviewed prior to issuing a lease. Additional information on this issue can be found in Becker et al. 2016; Walker et al 2019; NRC 2003; GAO 2002.
- Under Alternatives B and C, we recommend the following change: "...would be *adequately* reclaimed to ensure eventual restoration of ecosystem function, *productivity and value*. The leaseholder would develop and implement a BLM and USFWS-approved abandonment and reclamation plan.
- Under Alternative D, we recommend the following change: "...would be restored to ensure eventual restoration of ecosystem function, *productivity and value*, and meet *adequate* standards..."
- Under all Alternatives, we recommend changing "...visual, hydrological, and productivity objectives..." to "visual, hydrological, *contamination*, and productivity objectives..."
- Recommend adding the following requirement to this ROP and elsewhere as appropriate: "All survey flagging, stakes, wire, or other debris associated with this program should be removed from the Refuge. However, shot points may remain identified to assist the required summer cleanup crew until that project has been completed."

ROP 36:

- Recommend changing Requirement/Standard, line “d” to, “...assess and appropriate range of potential effects on resources and subsistence, *including contamination of those resources*, as determined...”

ROP 40:

- Lease Notice 1 provides language regarding ESA Section 7 Consultation. We suggest an additional Lease Notice be included for MMPA, similar to the following:
 - Lease Notice 2: The lease area may now or hereafter contain marine mammals. The BLM may require modifications to exploration and development proposals to further its conservation and management objective to avoid BLM-approved actions that would contribute impacts to marine mammals. The BLM would not approve of any action that may affect marine mammals until it completes its obligations under application requirements of the MMPA.

ROP 41:

- Along with approved studies that stipulate individual vehicles, suggest adopting general stipulations similar to guidance from state of Alaska DNR about summer off-road travel including:
 - Operations shall be restricted to dry uplands whenever possible.
 - Wetland crossing shall be minimized to the extent practical.
 - Multiple passes over the same area shall be kept to a minimum.
 - All operators should be made familiar with arctic vegetation types to ensure compliance.

ROP 42:

- Recommend clarifying in the existing Requirement/Standard that chasing wildlife with ground vehicles or *aircraft* is prohibited.
- Recommend adding a Requirement/Standard to avoid and minimize the disturbance to loafing and nesting birds to the extent practicable, unless deemed to be an invasive or invading species that may negatively impact other animals that are deemed to be a priority.
- Recommend adding a statement under Requirement/Standard: “Disturbance to both bald and golden eagles is prohibited under the Bald and Golden Eagle Protection Act (BGEPA). Appropriate spatial buffers around nests may be required to avoid take (including disturbance) by project activities. Buffer distances are both species and activity (e.g. land clearing, vehicle operation, building construction, pile driving, aircraft operation, etc.) specific. Buffer sizes range from 330 feet to 2 miles. To avoid violations of the BGEPA, the USFWS recommends project proponents apply for a USFWS Eagle and/or Eagle Nest Take Permit prior to conducting any activity with potential to take (including disturb) eagles or their nests (occupied or unoccupied).”

ROP 43:

- If gravel is to be brought in from off the Refuge it will be clean of invasive species or “weed free”.
- Annual monitoring for nonnative species will likely not allow for adequate eradication and control measures to be implemented. Because most invasive plants are wind-dispersed, if anything is detected, it should be eradicated immediately, not the following year. Therefore, all appropriate NEPA documents, Refuge Pesticide Use Permits, and Certifications must be in place prior to any oil/gas activities occurring on the Refuge, to allow an ADEC-certified chemical applicator to

conduct eradication/control efforts in response to the observance and documenting of invasives during growing season.

- Executive Order 13112 (1999) requires all federal agencies to prevent the introduction of invasive species; provide for their control; and minimize their impacts to the local economy, ecology, and human health. We recommend adding the following language under the Requirement/Standard: "In consultation with the USFWS, the operator/contractor shall develop and implement a long-term monitoring and treatment plan for invasive plant species, in conjunction with the authorized work. This plan shall be developed prior to the start of work, to allow for review and subsequent approval by the USFWS."
- Recommend changing the Requirement/Standard to read: "...detailing the methods for cleaning equipment and vehicles, *including off-site disposal of cleaning fluids or materials and detected organisms*, and monitoring..."
- Erosion waddles and similar have been identified as vectors for invasive species. Therefore, these should be certified weed-free prior to allowing their use on the Refuge.
- There are so few invasives that have been documented north of the Brooks Range that it is imperative a project of this magnitude implement a higher standard of care when addressing the potential for the spread of invasives. Therefore, all equipment must be thoroughly washed at the point of departure to ensure invasives are not brought onto the Refuge. If being transported on trailers up the haul road, by barge or plane, all equipment should be cleaned at the point of departure and not cleaned in Deadhorse, Kaktovik, etc. Additionally, an approved Invasive Plant Management and Response Plan should be in place that addresses all approved chemicals for use on the Refuge, certifications of those who will be applying those chemicals and how often those chemicals can be used.

Additional Recommended Stipulations and ROPS

- Under all alternatives, we recommend adding the requirement for development of spill response plans, which is currently only under Stipulation 4, Alternative D, Standard iv (with *these edits*): "Operators would be responsible for developing comprehensive *spill* prevention and response plans, including Oil Discharge Prevention and Contingency Plans and spill prevention, control, and countermeasure plans and maintain adequate oil spill response capability to effectively respond during periods of *ice*, broken ice, *or* open water, based on the statutes, regulations, and guidelines of the EPA, Alaska Department of Environmental Conservation (ADEC), and the Alaska Oil and Gas Conservation Commission (AOGCC), and well as Best Management Practices (BMPs), stipulations, and policy guidelines of the BLM *and USFWS*." Alternatively, we recommend creating a Stipulation or ROP to address this requirement, which is then required across all habitats. Any requirement for development of spill response plans should reference water quality standards for a suitable river's preliminary classification.
- A concern with oil development on the North Slope has been the lack of data to assess cumulative impacts of oil and gas development (see National Research Council Report, Cumulative Environmental Effects of Oil and Gas Activities on Alaska's North Slope (2003)). Therefore, we recommend a long-term monitoring program be developed that analyzes the effectiveness of the Lease Stipulations and ROPs. Statistically valid sampling designs with clearly defined levels of inference and change detection capabilities should be included in the design. Development of this program would help detect impacts and employ adaptive management techniques as necessary.

Section 3: Resource Specific Comments

Subsistence and Section 810 Analysis, Appendix E

- Conclusions of no positive findings for Alternatives B, C, and D within the DEIS (e.g., the DEIS concludes that Alternatives B, C, and D will not result in a significant restriction in subsistence uses) are not justified, particularly in light of a positive finding for the cumulative case. The potential impacts on caribou abundance, distribution, and movements are far more likely to affect availability of caribou to subsistence users throughout the PCH range than the relatively minor, local effects of limiting access by Kaktovik residents to some areas on the coastal plain. Statements such as “Potential impacts on subsistence resources and access from future oil and gas exploration, development, and production would be minimal or would be adequately mitigated by stipulations or ROPs...” (page E-10) may be overly optimistic given that these recommendations were mostly developed for oilfields farther west, and have not been tested for the PCH. Given the lack of testing for the PCH, there is uncertainty regarding the effectiveness or adequacy of the mitigation measures in this situation. This means that abundance and, or movements of the PCH could be substantially affected, with resultant effects on availability of caribou to subsistence hunters throughout the herd’s range. Recommend this uncertainty be acknowledged by a positive determination for all the action alternatives.
- Section E.3-22, Page E-7: The DEIS states, “In general, caribou responses to aircraft adhering to effective stipulation measures tend to be short-lived (Fullman et al. 2017).” Fullman et al. (2017) has been frequently mischaracterized in the literature. These authors used a limited dataset on take-offs and landings and did not consider flight altitude and patterns near the herd, distance from lead caribou, private aircraft, disturbance near narrow mountain corridors, or any number of other potentially important factors. The authors do, however, indicate that their results are limited to movements within the Noatak River valley. Given that, this paper does not lend itself to the broad application suggested in the 810 analysis. Additionally, it should be highlighted that the short-term effects of aircraft activity on caribou movements and resultant hunter success may be critical to subsistence opportunity and food security. This concern is frequently voiced by subsistence hunters of the coastal plain.
- Section E.3-22, Page E-7: The DEIS states, “Low-level flights or maneuvering in the presence of unhabituated caribou can elicit increased speed and abrupt direction change. Alternatively, caribou can become habituated to aircraft, particularly when aircraft pilots maintain altitudes greater than 500 feet above ground level and do not haze or harass the caribou (Valkenburg and Davis 1983).” Habituation and avoidance behavior may take quite some time and this should be pointed out in the 810 analysis. A recent analysis by the Office of Subsistence Management included the following information: studies [of caribou] have also reported reduction in the use of areas within 5 km from infrastructure and human activity (including aircraft) by 50–95% for weeks, months, or years (Vistnes and Nellemann 2008, Flydal et al. 2002). We recommend the potential for reduced use of areas in proximity to infrastructure be fully disclosed.
- Section E.3-22, Page E-7: The DEIS states, “Caribou crossing success would vary by season, behavioral motivation, level of habituation, and activity levels” but also states on page E-6, “Caribou abundance or availability and the subsistence use thereof would not likely be affected as a result of direct habitat loss.” These statements seem incongruent as there are too many unknowns about the short and long-term changes to migration patterns that may result. Minor changes, even if temporary, may have major impacts to subsistence if caribou move further from communities and traditional hunting grounds. Caribou migration patterns are very complex and the Fullman et al.

(2017) paper, though a useful starting point, should not be considered definitive evidence of minimal effect. As mentioned in previous comment, habituation can take months or years.

- With regards to ensuring a meaningful subsistence experience, page 3-121 of the DEIS includes the following:

In addition to affecting resource availability, future noise, traffic, and human activity may also affect user access by deterring subsistence users from their usual harvesting areas. Avoidance of subsistence use areas due to development has been documented in Nuiqsut (SRB&A 2017) and would likely occur for some Kaktovik harvesters if development occurs in their harvesting area. Residents may experience discomfort hunting in the presence of outsiders; may avoid hunting near areas of high air or ground traffic because of a perceived or actual reduction in the availability of subsistence resources; may avoid hunting near activity due to safety concerns; or may consider noise pollution and increased human activity to degrade the subsistence experience.

We recommend the above language also be included in the 810 analysis. The ANILCA protects and recognizes many values associated with subsistence, far beyond the nutritional value. The cultural values associated with the subsistence “experience” need to be explicitly stated. In one example, noise pollution may affect these experiences as was noted in Chapter 3. We recommend including factors discussed in Halas (2015) as important factors affecting the subsistence experience. One potentially relevant quote from this paper:

Whether the aircraft intentionally or unintentionally may be ‘influencing’ caribou movement, observing ‘scared’ caribou can be a powerful experience for hunters. Observations of caribou disturbance may impact the quality of a good hunting experience for a subsistence hunter. Respondents who perceived that caribou are impacted by the behavior of aircraft may evaluate their own harvest success to the interaction between aircraft and movement of caribou.

River Corridors Determined to be Suitable Additions to the NWSRS

- Section 3.4.7, Page 3-210, Wild and Scenic Rivers, Paragraph 4: In order to address interim management guidance for suitable rivers affected by proposed activities (whether the rivers lie inside or outside the project area), we recommend that the first sentence be changed to: “The Marsh Fork-Canning, Hulahula, and Kongakut Rivers are north-flowing waterways found to be...”. Change last sentence of paragraph to: The Marsh Fork-Canning (Recreational ORV) and Kongakut (Recreational, Scenic, and Geologic ORVs) Rivers are not within the project area, but stipulations and ROPS would be applied to protect their WSR characteristics (e.g.: the scenic ORV for the Kongakut River may necessitate modeling and additional setbacks within the project area to insure infrastructure is not visible from any point within the Kongakut River corridor; or the sport fishing opportunities described as part of the Marsh Fork-Canning recreational ORV may be preserved by stipulating program actions within the downstream project area) (see Section 5.7.2 of CCP, Appendix I: Wild and Scenic River Review).
- Section 3.4.7, Page 3-214, Impacts Common to all Action Alternatives: In order to address interim management guidance for suitable rivers affected by proposed activities (whether the rivers lie inside or outside the project area), we recommend changing the sentence beginning with “General impacts...which could affect cultural, fish, geologic, recreation, and wildlife ORVs.” to also include the scenic ORV.

- Section 3.4.7, Page 3-214-3-215: We recommend providing additional information on why setback distances are different across alternatives, what the ecological justification for the differences is, and what the relative impact of the different setbacks on the achievement of the stated objectives in Stipulation 1 is.

Fish and Aquatic Species

- Section 3.3.2 Fish and Aquatic Species, Affected Environment, Page 3-80, last two sentences of last paragraph in section on Direct Habitat Loss or Alteration: The last two sentences in the paragraph suggest that placing gravel mines in river beds and subsequently creating deep water reservoirs could be seen as a long-term benefit for fish in the area. These alterations should be viewed as an anthropogenic alteration of the natural habitat rather than an enhancement. Recommend the last sentence be deleted and the second to last sentence be edited to read, "Following gravel extraction, the excavation can then serve as a water reservoir for industrial activities, which is common practice in other North Slope gravel mines farther west (BLM 2012)."
- We recommend adding a description of the seasonal use of the nearshore marine waters and lagoons by fish within Section 3.3.2. This information is important in understanding the seasonal movement of fish and how the proposed activities will affect fish and subsistence users. For instance, as winter approaches and the lagoons begin freezing up, anadromous fishes return to freshwater environments and marine fishes eventually retreat to offshore environments.
- We recommend adding a description of the difference between rivers with and without perennial springs. This description would provide helpful background for the proposed protections for perennial springs. It is known that the perennial springs support fish during harsh winters and rivers without springs have no fish. This spring water is believed to be ancient, having fallen as precipitation on the south side of the Brooks Range hundreds to thousands of years ago. All Arctic Grayling and Dolly Varden are major subsistence resources in the Arctic Refuge and their survival depends on approximately twenty springs found within the coastal plain and adjacent foothills, thus they are truly critical habitats. Only four rivers that cross the 1002 Area support major anadromous or endemic fish populations requiring special recognition.

Polar Bears

- Page 3-125: In the second full paragraph, the DEIS confuses incidental take with intentional take. ITRs and associated LOAs are for the incidental take of polar bears as a consequence of an otherwise lawful activity. Independent of that, authorizations are provided to allow intentional take through harassment in order to protect human life.
- Page 3-127: The DEIS states that critical denning habitat for polar bears only occurs in those areas with topography sufficient to capture enough snow for dens to be constructed. However, the actual critical habitat designation covers a much larger area and includes not only the microhabitat features (i.e., those where snow can accumulate), but also the macro-habitat features that allow bears to access those features and move back to the sea ice post emergence. This should be corrected in the final EIS.
- Page 3-133: The DEIS states that post-lease activities could include seismic, but fails to consider the fact that due to the future leasing activities analyzed in the DEIS, seismic surveys could occur prior to leasing. We recommend correcting this in the final EIS.

- Page 3-137: The DEIS states “If dens are detected within a 1-mile buffer zone around the proposed locations of roads and pads, then the facility locations would be moved outside of that radius to avoid dens, as required by ITRs, to reduce the effects on occupied dens to a negligible level.” While that is currently true, if new data emerged that suggests bears could be disturbed at distances >1 mile, then a larger buffer would be required. Similarly, if data supported a smaller area, a smaller buffer could be required. We recommend the language be revised to reflect that this no disturbance buffer is subject to change.
- Page 3-141: The discussion of the potential effects of an oil spill on polar bears is not sufficient. While it’s true that a spill associated with an accident involving a barge would likely be smaller than that modeled for an offshore oil well, sufficient volume of oil could still be released that could harm polar bears. This is especially true depending on where and when barges are likely to land. If barge landings are in the vicinity of Kaktovik, they could coincide with large aggregations of bears during the open water period. A spill adjacent to those waters could expose a large number of polar bears.
- Page 3-146: The DEIS states, “The highest number of documented historical polar bear dens and the greatest area of potential maternal denning habitat occur in the high- and medium-potential hydrocarbon zones, where the least restrictive development activities would be most likely to occur.” This statement reinforces our concerns over the level of protection afforded to polar bears under Alternatives B and C, and highlights the need to provide the level of protections for polar bears found in Alternative D in any and all development scenarios.
- Page 3-146: The DEIS states, “Under ROP 10, the pre-activity surveys required to locate dens, plus the 0.5-mile and 1-mile buffers for seismic and heavy equipment operation around occupied dens of grizzly and polar bears, respectively, would help to reduce the impacts of behavioral disturbance on denning bears (as well as birth lairs of ringed seals on landfast ice along the coast) throughout the entire program area.” However, Alternatives B and C do not require such surveys, just a requirement to avoid known dens. We recommend changing the ROP under Alternatives B and C to require den surveys. Without the requirement for surveys to detect dens, the requirement to avoid known dens carries greatly diminished conservation value.
- Map 3-24: The map legend is mislabeled. It states that the stars are potential denning habitat when in reality they depict sites of known polar bear dens observed over the years. Additionally, those data are wrongly attributed to Durner et al. (2006) rather than to the USGS den catalogue. Similarly, the yellow lines depicting potential denning habitat should be cited as Durner et al. (2006) rather than just “Durner data” and should be labeled as “polar bear denning habitat” rather than just “polar bear habitat”.

Terrestrial Mammals

- Page 3-115: The DEIS states that, “Similar delays have not been observed in caribou in the existing North Slope oil fields, ...” Recommend modifying this statement to state: “Although CAH caribou have been observed to cross roads and pipelines in the existing North Slope oil fields during the summer insect season, fine-scale studies of CAH movements like those of caribou near the Red Dog mine road have not been conducted.” As currently worded, it implies that a study has looked at this and not documented a delay. To our knowledge, there has not been a study looking at caribou movements at the spatial/temporal scales required to detect an effect for caribou in the oil fields.
- Page 3-120: The DEIS states that under Alternative D, Lease Stipulation 5 would prohibit winter activity within 1 mile of polar bear denning habitat. This is not accurate, as the stipulation states activity within a mile of denning habitat in particular regions of the Coastal Plain would be

restricted, but not the entire region. We recommend correcting the statement to better reflect what Lease Stipulation 5 actually requires.

- Page 3-108: Recommend adding the following information to the discussion of muskox: “Another group of approximately 24 muskoxen inhabits the northwestern Yukon Territory, is commonly found near the Alaska-Yukon border and frequently wanders into the Refuge. They have been found as far west as the Aichilik River, on the boundary of the program area.”
- Page 3-108: Because of the importance of moose to subsistence hunters, and thus being included in both the conservation and subsistence purposes of the Refuge, we recommend including maps of current moose winter habitat and locations of moose found on spring surveys. The Service can provide these. We also recommend including the following information in the discussion of moose on the coastal plain: “Moose numbers east of the Canning watershed are currently low, but numbers in tributaries of the Canning (both east and west sides) are greater; some of these would be in the project area and other moose just outside the area to the west could be affected by equipment moving into/out of the area. Moose aggregate in brushy habitat along streams during winter, but then disperse across the ACP during summer (particularly pregnant cows). Moose are an important subsistence species for Kaktovik hunters, who are extremely interested in seeing moose populations recover to previous levels that will allow additional hunting opportunities.”

Wildlife Direct and Indirect Impacts

- Recommend providing a quantitative analysis of direct and indirect impacts to wildlife where possible or summarizing the results of quantitative studies that have been completed. For example, the following study is an example of where a quantitative analysis was completed for the PCH and should be incorporated into the description of impacts: *Russell, D., and A. Gunn. 2019. Vulnerability analysis of the Porcupine Caribou Herd to potential development of the 1002 lands in the Arctic National Wildlife Refuge, Alaska. Report prepared for: Environment Yukon, Canadian Wildlife Service, and GNWT Department of Environment and Natural Resources. 143 pp.*
- Given the importance of moose as a subsistence species to local communities, we recommend adding a description of potential impacts of development on moose, including: disturbance of cows during calving and displacement during summer from coastal plain habitats with few predators, impacts to riparian vegetation that may reduce moose winter habitat, displacement of moose from winter habitat, disruption of movements to/from seasonal ranges, changes in predator abundance and distribution as a result of supplemental foods or habituation to humans.
- Page 3-110: Please include moose in the list of mammals (grizzly bear and muskox) that may be disturbed by winter seismic exploration.
- Page 3-110: Although it is true that only a small proportion of the PCH remains on the ACP during winter, these caribou can number in the hundreds and are an important winter subsistence resource for Kaktovik hunters. Thus, localized disturbance or displacement of caribou during winter could have a significant impact on subsistence hunters. Recommend clarifying that although the number of PCH caribou on the ACP during winter is small, they are still an important subsistence resource for local communities.
- Page 3-113: Please provide citations for the sentence “Although some habitat damage would result from the use of ice roads and pads because the ice road is temporary, the long-term impacts would be considerably less than those associated with gravel roads and pads”. Ice roads and snow trails have the potential to delay green-up in affected vegetation, and may retard growth during an entire

growing season. This effect could be repeated every year that exploration and development occur. Additionally, these routes are likely to be much wider than a gravel road, with the potential to impact more habitat in a given year resulting in greater impacts to caribou habitat.

- Page 3-114: Recommend revising the sentence that begins “The patterns of CAH demography following development should be applied to the PCH with caution...” to “Demographic changes exhibited by the CAH during the development period cannot be extrapolated to the PCH due to the substantial differences between these herds and the geography of their ranges.” For example, the CAH was at an historic low point in the herd’s abundance when development began, whereas, the PCH is currently at an historic high level. In addition, compared to the CAH, the PCH has shown a much lower population growth rate during periods of increase; concentrated calving density of the PCH is much higher; areas surrounding the PCH calving grounds contain less high-quality forage and higher predator densities; and these areas exhibit more topographic relief than do the current PCH calving grounds or areas used by the CAH following displacement from their original calving grounds (Clough et al. 1987; Griffith et al. 2002).”
- Page 3-115, Paragraph 2: The following studies related to caribou should be included in this section: Smith and Cameron, 1985; Curatolo and Murphy, 1986; Murphy and Curatolo, 1987; Murphy, 1988. These studies indicate that large groups of caribou were less successful in crossing roads and pipelines during insect harassment, which is likely to be more of an impact for the much larger groups typical of the PCH during summer.
- Page 3-115, Paragraph 5: It is not clear how the definition of PCH calving area was determined to be the “concentrated calving area during >40% of years”, as the most of the 1002 area is used for calving by either the PCH or CAH, and often both herds. Recommend providing additional discussion and citations as to how this was defined.
- Page 3-116: There is substantial uncertainty that design specifications outlined in ROP 23 will be sufficient to minimize disruptions to caribou movements in the 1002 Area due to substantial differences in geography and herd characteristics. Recommend adding a description of the substantial uncertainty that exists regarding whether these practices will be sufficient, and a statement that additional restrictions may be necessary to maintain the ability of the PCH to continue unrestricted use of the area.

Resident and Migratory Birds

- Section 3.3.3 Birds, Affected Environment, Shorebirds: Only the following 10 species are fairly common, common, or abundant in the program areas: American golden-plover, ruddy turnstone, semipalmated sandpiper, red-necked phalarope, red phalarope, Western sandpiper, dunlin, stilt sandpiper, pectoral sandpiper, and long-billed dowitcher. The following four additional species are less common: semipalmated plover, Baird’s sandpiper, whimbrel and buff-breasted sandpiper (based on PRISM surveys reported in Brown et al. 2007). Data from transmitters indicate that some birds also migrate westward across the ARCP before migrating southwest across Alaska and down either the Pacific Flyway or the East Asian-Australasian Flyway. Recommend correcting the information related to species abundance and including information related to the eastward migration that occurs. Brown et al. (2007) is the best source of data for shorebirds relative to the project area.
- Section 3.3.3 Birds, Affected Environment, Climate Change: Although summer duration may increase due to climate change effects, it is unlikely that insectivores will increase as invertebrate emergence is mediated by snow melt initially, followed by cumulative degree days of temperature. The volume of invertebrates may be limited, with the emergence simply occurring earlier. Contrary

to what is stated in the DEIS, avian habitat is changing rapidly, both on the coast and inland tundra areas. Comparison of photographic images taken at Prudhoe Bay in the 1980s and the present show the landscape drying up, with a change from low-centered polygons to high-centered polygons (see Liljedahl et al. 2016). This in turn is leading to drainage of uplands and creation of larger water bodies that may indeed be good for species of waterfowl and loons. River deltas may also be affected from reduction in glacier melt-off. This change and the storm surges could affect migratory birds through changes in invertebrate distribution and composition (Churchwell et al. 2018). The DEIS does not correctly assess the potential impacts to birds and their habitat resulting from the changing climate. Please ensure the EIS accurately assesses the potential impacts to birds and their habitat resulting from a changing climate based on the best available science.

- **Section 3.3.3 Birds, Affected Environment, Direct and Indirect Impacts:** The DEIS understates the potential impact from water removal during ice road construction on wildlife. The 1002 Area has relatively few water resources compared to the NPR-A and the use of large volumes of water could negatively affect nesting habitat in the succeeding summer. Breeding grounds are the only place for the birds to increase their numbers, and thus are an essential part of the annual cycle for maintaining bird numbers. Please ensure the document more accurately reflects the potential impacts to breeding birds from the project as a result of water removal.
- **Page 3-92:** The indirect effects of post-leasing oil and gas activities on birds should be included in the DEIS, including the indirect effects of increasing contaminant concentrations below levels that would cause mortality. This discussion should include mobilization of contaminants, particularly heavy metals, from climate change (e.g., flood events contributing to increased erosion and release of contaminants from glaciers); earth-disrupting activities contributing to dust, sedimentation, or erosion; and activities that may result in melting permafrost with subsequent mobilization of mercury. These activities have the potential to increase contaminant concentrations in birds of the Arctic Refuge, especially those that eat invertebrates (shorebirds, nesting waterfowl) and fish (loons), and in raptors to levels below those that may cause mortality, but which may still result in population-level effects such as decreased productivity.
- **Page 3-99:** We disagree that “salt-water spills would not be toxic to birds,” especially if spills occurred in waterfowl breeding ponds. Newly hatched ducks have poorly developed salt glands and exposure to elevated salinity can cause impacts including mortality (e.g., DeVink et al. 2005). Additionally, saline spills can kill invertebrate prey.
- **Page 3-84, Paragraph 7:** Arctic Refuge CCP 4.3.6 states, “In the northern foothills of the Brooks Range, Arctic coastal plain and adjacent marine waters, 158 species have been recorded”. It appears the species list from Appendix F in the CCP was used here to assign a number of 158 species, but the inclusive areas for these sections is slightly differently between the CCP text and Appendix F. Please change, “According to the USFWS (USFWS 2015a), 156 bird species have been recorded in the Arctic Refuge on the northern foothills of the Brooks Range, in the ACP (an area inclusive of the program area), and in adjacent marine waters” to “According to the USFWS (USFWS 2015a; Appendix F), 156 bird species have been recorded in the Arctic Refuge Coastal Plain [i.e., the area between the coast and the Brooks Range inclusive of coastal areas (lagoons, barrier islands, and Beaufort Sea) and inland areas (uplands near the foothills of the Brooks Range)]”.
- **Page 3-85, Paragraph 1:** The statement, “With few exceptions, all birds in the program area are migratory and are present only during the summer breeding season, May to September, depending on species” is incomplete. Several raptor species may occur during the latter part of winter in the Program Area. Breeding golden eagles return to Alaska, including the Arctic Refuge, from late February to mid-April, with non-breeders arriving later (summarized in Kochert et al., 2002). Within the Arctic Refuge, most golden eagle nests are initiated in mid-April (range: late March to early

May) (Young et al., 1995). Some snowy owls winter on Arctic breeding grounds, but most arrive during April and May, with most egg laying occurring in mid-May (summarized in Holt et al., 2015). Some marine birds occur in the area throughout October and into November and leave with advancing sea ice. In the immediate area offshore, such species groups include larids, murres, puffins, guillemots, seaducks, and sometimes shearwaters (Kuletz et al. 2015; Kuletz and Labunski 2017, Appendix 1; USFWS data). Please change to, “With few exceptions, all birds in the program area are migratory and present February to November, depending on species”.

- Page 3-85, Paragraph 1: Some snowy owls winter on Arctic breeding grounds, but most arrive during April and May, with most egg laying occurring in mid-May (summarized in Holt et al., 2015). Appendix F of the CCP states, “Rock ptarmigan (*Lagopus muta*) – Common permanent resident in all areas of Refuge.” Please change, “Winter residents include small numbers of ravens and ptarmigan, dippers near open running water, and occasional gyrfalcons” to, “Resident birds include ravens, ptarmigan, dippers near open running water, snowy owls, and gyrfalcons”. Cite the CCP and citations below.
- Page 3-85, Paragraph 2: Sentence, “Shorebirds and passerines are the most abundant guilds of nesting birds on the ACP (Liebezeit et al. 2009)” could be more specific. Data on population size is available for the ARCP, so using information for the whole of the ACP seems unnecessary. Also, the cited reference did not conduct extensive surveys across the whole of the ACP for estimating density, therefore this reference does not support the statement as given. Please change to, “Shorebirds and passerines are the most abundant guilds of nesting birds on the ARCP (Bart et al. 2012).”
- Page 3-85, Paragraph 3: The Affected Environment coverage of the “marine vessel route to Dutch Harbor” should be expanded. This route may impact areas used by the ESA listed short-tailed albatross and species of concern such as yellow-billed loon, red-legged kittiwake, Aleutian tern, and Kittlitz’s murrelet. Special consideration should be given to Important Bird Areas and “hotspots” that occur along the route. For examples, the area near the mouth of Barrow Canyon (and around Point Barrow) is a “hotspot” of marine bird and marine mammal activity throughout summer and fall “hotspots” occur offshore from Wainwright (head of Barrow Canyon) and over Hanna Shoal area (see Kuletz et al. 2015). Any marine vessel route would pass by large seabird colonies at Cape Lisburne (northernmost seabird colony of AMNWR) and Cape Thompson. Vessels would have to go through Barrow Strait, an Important Bird Area (Smith et al. 2017) and recognized “hotspot” for marine birds (Humphries and Huettmann 2014; Kuletz et al. 2015). The Bering Strait region supports mixed-species colonies of millions of birds (Stephensen and Irons 2003), with some of the largest seabird colonies in the world on Diomedes, King Island, St. Lawrence Island, and farther south – St. Matthew Island. An estimated 12 million seabirds aggregate in the Bering Strait region in summer through early fall (USFWS 2014). There are many “Important Bird Areas” identified along the route to Dutch Harbor and nearby Aleutian passes (Smith et al. 2014; 2017). Please add “waterbirds” and “larids” to the groups discussed in this section.
- Page 3-85, Paragraph 4: The statement, “The ARCP represents a substantial portion of the Beaufort Sea coastline in Alaska. Accordingly, it also supports a large number of birds during the important nesting, rearing, and migration staging periods” is incomplete. The coastal lagoons and deltas provide important stopover habitat during spring migration/pre-breeding period, as well. Please change to, “The ARCP represents a substantial portion of the Beaufort Sea coastline in Alaska. Accordingly, it also supports a large number of birds during the important pre-breeding, nesting, rearing, and migration staging periods.”
- Page 3-85, Paragraph 4: The statement, “Prior studies (summarized in USFWS 2015a) have demonstrated that at least several hundred thousand breeding and nonbreeding birds use the ARCP

and program area during the short arctic summer” is incomplete. Likely as many or more birds use the ARCP during the fall. Please change to, “Prior studies (summarized in USFWS 2015a, Pearce et al. 2018, USFWS and BLM 2018) have demonstrated that at least several hundred thousand birds use the ARCP during for breeding in the short arctic summer and fueling and resting during migration in the fall”.

- Page 3-86, Paragraph 1: The unpublished data cited here belongs to USFWS, not Mr. Latty. Also, one nest was included in an unpublished report, (Kendall and Villa 2006). Please change “(Latty, unpublished data)”, to “(Kendall and Villa 2006, USFWS, unpublished data)”.
- Page 3-86, Paragraph 1: The statement “The spectacled eider is an uncommon breeder in the program area, and nests have been documented only on the Canning River delta” only pertains to recent records of known spectacled eider nests found during operations of a primarily shorebird research site on the Canning River Delta and is therefore misleading. An exhaustive search for all records of spectacled eider nests occurring in the program area has not been conducted. This statement should also not be interpreted to mean that all locations within the program area have been searched to determine presence or absence. Rather, it only means that a few spectacled eider nests were found as part of other operations (primarily shorebird research) at a single small site on Canning River delta. There have been NO systematic ground surveys specifically targeting eider nests (outside the barrier islands) anywhere in the program area in the recent past. Please change to, “The spectacled eider is an uncommon breeder in the program area. Nests have been documented on the Canning River delta, but contemporary systematic ground surveys targeting tundra-breeding eiders have not been conducted.”
- Page 3-86, Paragraph 2: Spectacled eider nest density is expected to be low in the program area where suitable habitat is available. Please change, “Low numbers of spectacled eiders are expected to occur in the program area during the pre-nesting period, where suitable habitat is available”, to “Low numbers of spectacled eiders are expected to occur in the program area during the pre-nesting and nesting period, where suitable habitat is available.”
- Page 3-86, Paragraph 3: Within the DEIS ‘Waterbirds’ appears to include mergansers and seaducks. Please include these groups in the list of Waterbirds (first line of paragraph).
- Page 3-86, Paragraph 4: In the second sentence, referencing the ACP survey, the text indicates that “prior to 2018 only about a quarter of the area was included...” Insert “program” prior to “area”. Without that specificity, the text suggests that only a quarter of the ACP was surveyed, when in fact one quarter of the program area that was surveyed as part of the ACP breeding pair survey.
- Page 3-86, Paragraph 4: In the last sentence, please change “unreliable” to “imprecise”. There is a large difference in meanings, and “imprecise” is the correct term here.
- Page 3-86, Paragraph 4: Bart et al. (2012) provides estimates of waterbird population sizes for the ARCP. Please consider including these population estimates here.
- Page 3-87, Paragraph 1: The waterbird classification includes waterfowl like Northern pintail that often nest in dryer habitats. Bart et al. (2012) estimated more than 18,000 Northern pintail breed on the ARCP. Please change, “In addition to water body shorelines and islands, most waterbirds use a variety of wet and moist tundra habitats for nesting, often next to water” to “Most waterbird species nest in association with ponds or in wet and moist tundra habitats, but some species primarily nest in drier habitats”.

- Page 3-87, Paragraph 1: A significant portion of the estimated hatch dates for several geese species in the program area in some years occur in June. Please change, "After hatching in July and August, most waterbirds occupy lakes and ponds to rear their young, although geese and cranes graze in tundra wetlands" to, "After hatching in June through August, most waterbirds occupy lakes and ponds to rear their young, although geese and cranes graze in tundra wetlands."
- Page 3-87, Paragraph 1: The following statement is not accurate for most waterbird species occurring in the program area, "In the late summer, post-breeding and molting (temporarily flightless) waterbirds use coastal lagoons behind the barrier islands. Waterbirds continue to forage in the lagoons in the fall as they stage for the southward migration." Please remove that statement and insert "In the late summer, post-breeding and molting (temporarily flightless) sea ducks (primarily long-tailed ducks) use coastal lagoons. Sea ducks and other waterbirds continue to forage in the lagoons in the fall as they stage for the southward migration."
- Page 3-87, Paragraph 1: The statement, "Most waterfowl (swans, geese, ducks) migrate through the central continent to wintering areas across the continental US" is poorly defined and not correct as written. Please change to, "Most geese, swans, and dabbling ducks migrate through Pacific and Central Flyways after leaving the ARCP."
- Page 3-87, Paragraph 2: Map 3-15, Post-Breeding and Fall Staging Common Eider, in Appendix A, is incorrectly titled. Map 3-15 depicts locations of likely breeding and post-breeding common eiders from two separate surveys conducted to estimate breeding and post-breeding (staging/molting) sea bird distribution and abundance. Please correct as appropriate.
- Page 3-87, Paragraph 2: Language as written is incorrect and no source is provided for 1976 data. Please change "Common eiders have been increasing in abundance on their barrier island breeding grounds in the Arctic Refuge since 1976, when only 14 nests were found", to "Common eiders appear to be increasing in abundance on their barrier island breeding grounds in the Arctic Refuge since 1976, when only 14 active nests were found (Divoky 1978)".
- Page 3-87, Paragraph 2: The statement "Common eiders winter in coastal areas from the Aleutian Islands south to southern Alaska," is not correct. Common eiders breeding on Beaufort Sea barrier islands primarily winter near St. Lawrence Island and Chukota peninsula in the Bering Sea (though some also are known to winter in the Olyutorskij Gulf, northern Bristol Bay, and off the coast of the Yukon-Kuskokwim Delta). Please change to, "Common eiders breeding on Beaufort Sea barrier islands primarily winter near St. Lawrence Island and the Chukota peninsula in the Bering Sea, although some also have been documented wintering in the Olyutorskij Gulf, northern Bristol Bay, and off the coast of the Yukon-Kuskokwim Delta (Petersen and Flint, 2002).
- Page 3-87, Paragraph 2: The statement, "The USFWS conducts annual aerial surveys to estimate the number, distribution, and population trend of breeding common eiders in coastal habitats on the North Slope, including Arctic Refuge lands (summarized in USFWS 2015a)" is not accurate. The USFWS has not conducted aerial surveys of coastal habitats on the North Slope since 2009. Please correct language to recognize aerial surveys are not currently being conducted for common eider on the ACP, and have not in a decade.
- Page 3-87, Paragraph 2: The data referenced in, "In a 2015 ground-based survey conducted across most Arctic Refuge barrier islands, over 800 common eider nests were found (Latty, unpublished data)" belongs to USFWS, not Mr. Latty and the language is imprecise. Please clarify differences in spatial coverage between these two surveys. Please change to, "In a 2015 ground-based survey conducted across most Arctic Refuge barrier islands, over 800 active and inactive common eider

nests were found (USFWS, unpublished data). There were differences in spatial coverage between the 1976 and 2015 surveys, primarily because the islands are constantly being reshaped.”

- Page 3-87, Paragraph 4: The statement, “In aerial surveys of nearshore waters and barrier islands conducted during the early post-breeding period (early July 1999–2009)” does not describe the survey referenced. The latest report on that survey, “Aerial Population Surveys of Common Eiders and Other Waterbirds During the Breeding Season - Northwestern Alaska 2006-2009” by Bollinger et al. 2012 states, “The objectives of this Northwestern Alaska Common Eider Survey were to: 1) Estimate a population index during the breeding season....” (2012). The report also states, “All surveys were flown during the interval from 15 June to 01 July (Table 2). Survey timing was intended to coincide with egg laying and early incubation while pair bonds are still intact and prior to the dispersal of males to molting sites” which does not match the statement in the DEIS. Please change this sentence to, “In aerial surveys of nearshore waters and coastal areas near barrier islands conducted during June and early July 1999–2009.”
- Page 3-88, Paragraph 2: Please provide a citation to support the statement, “It is likely that many of the birds using lagoons along the Arctic Refuge coast during post-breeding nested to the east, particularly in northern Canada” or remove.
- Page 3-88, Paragraph 3, Sentence 1: The 325,000 estimate is 40 years old and therefore should be referenced in the past tense. The most recent (15 year old) estimates are approximately 185,000 (Kendall 2006).
- Page 3-88, Paragraph 3: Please provide the Arctic Refuge CCP as a citation for the statement, “Up to 325,000 snow geese of the Western Arctic Population use the ARCP as a staging area for fall migration (USFWS and BLM 2018)”. Please change to, “Up to 325,000 snow geese of the Western Arctic Population use the ARCP as a staging area for fall migration (USFWS 2015a).
- Page 3-88, Paragraph 4: The Shorebirds of Conservation Concern in the United States of America - 2016 (U.S. Shorebird Conservation Plan Partnership, 2016) is the most up-to-date conservation status document for North American shorebirds; therefore, this list should be identified in the Affected Environment text, not just in the Appendix.
- Page 3-88, Paragraph 6: The statement, “Shorebirds use a wide range of aquatic, wet, and moist tundra habitats for nesting, often near bodies of water” is not correct as written. While most shorebirds prefer moist tundra, some use drier habitat and riverine areas. For example, whimbrels were only found in upland habitats on previous ARCP shorebird surveys. Please change to, “ARCP shorebirds use a wide range of tundra habitats for nesting. Most species occur in wetland, moist, and riverine habitats, but some species prefer drier upland sites (Brown et al. 2007).” Alternatively, remove this sentence and incorporate the information in the next sentence that includes the Brown et al. citation.
- Page 3-89, Paragraph 1-3: This section excludes discussion of bald eagles. Although not as abundant as golden eagles, bald eagles also occur on both the coastal plain and in the foothills of the Brooks Range. Please update text to reflect this information.
- Page 3-89, Paragraph 2: Up to several thousand shorebirds at a time may occur on individual river deltas in July and August (Churchwell 2015). Please change, “Most of the deltas are used by large numbers of foraging shorebirds” to “Most of the deltas are used by large numbers of foraging shorebirds. Up to 4,000 shorebirds were counted on daily surveys at Jago and Okpilak River Deltas in 2011 (Churchwell 2015)”

- Page 3-89, Paragraph 4, Line 7: Additional larid species encountered along the vessel route to Dutch Harbor (USFWS survey data, most in Kuletz and Labunski 2017) would include slaty-backed gull, red-legged kittiwake, Aleutian tern; (latter two are breeding birds of conservation of concern). These species should be included here. Also, it was difficult to determine the vessel route, and not clear what that route would be used for – or how much vessel traffic the project would generate (especially through the Bering Strait). This information is necessary to adequately assess the affected environment and potential impacts.
- Page 3-89, Paragraph 5: Last line of paragraph. When offshore or over marine waters, jaegers also eat fish (and scavenge or steal those from other seabirds and larids). Please correct this in text.
- Page 3-91, Paragraph 2: Line 1-2. From our USFWS at-sea surveys in the waters off of ARCP, in addition to ones listed in Table J-9, glaucous gull, black-legged kittiwake, Ross’s gull, Sabine’s gull, and Kittlitz’s murrelet have also been recorded (see Kuletz and Labunski 2017, Appendix 1 for maps, or Kuletz et al. 2015 for some species; also USFWS/Kuletz, unpublished data). Please update text to reflect this information.
- Page 3-91, Paragraph 3: The DEIS contains few details regarding the “the marine vessel route to Dutch Harbor.” Vessels traveling through the Chukchi Sea and down length of the Bering Sea to Dutch Harbor could encounter more than 63 species of marine birds. As written, little information is given for the Affected Environment for the vessel route to Dutch Harbor, which reduces the ability to estimate potential impacts or threats. Please clarify the details of the “the marine vessel route to Dutch Harbor”, fully describe the Affected Environment in the appropriate sections in 3.3.3, and then discuss the potential impacts in the Direct and Indirect Impacts section beginning on page 3-92.
- Page 3-91, Paragraph 3: The ESA-listed short-tailed albatross occurs regularly (if not abundantly) in the southern portion of the route, and occurs in the northern portion in late summer and fall (especially the northwest outer shelf break, near the International Date Line), and near St. Lawrence Island. The short-tailed albatross and two other albatross species (black-footed and Laysan) have all increased in abundance and shifted distribution northward in the Bering Sea in recent decades (Kuletz et al. 2014), and so would be present en route to Dutch Harbor. The Aleutian passes, especially Unimak Pass near Dutch Harbor, have the highest risk to seabirds from vessel accidents (Renner and Kuletz 2015, Humphries and Huettmann 2014) and very high densities of albatrosses occur there. The first recorded sighting of a short-tailed albatross in the Chukchi Sea was made in 2011 (Day et al. 2013); thus, it could be encountered in that portion of the vessel route as well. Please update text to reflect this.
- Page 3-91, Paragraph 5: It should be noted here that seabird die offs have occurred in the Bering Strait region in 2017 and 2018 (USFWS 2017, 2018) and were associated with very warm water conditions; die offs in this region were previously very rare (or perhaps never recorded, with exception of the 2013 die off near St. Lawrence Islands). Birds died from starvation, although effects of toxins cannot be ruled out. The combined effects of increased vessel traffic, disturbance, noise, and changes in prey and sea ice have potential for increased cumulative effects. Please update text to reflect this information.
- Page 3-91, Paragraph 5: Predation is the primary factor affecting productivity for many ARCP breeding birds, but recent work suggests predation is increasing in the Arctic and maybe linked to climate-induced shifts in predator-prey relationships. Please add, “Recent work suggests predation is increasing in the Arctic and is linked to climate-induced shifts in predator-prey relationships (Kubelka et al 2018)”.

- Page 3-91, Paragraph 5: A climate change vulnerability assessment on Alaska's North Slope identified the barrier island nesting Pacific common eider as the marine bird at highest risk of climate change impacts, including impacts from predicted sea level rise, increasing storm surges, and erosion and/or restructuring of barrier islands (Liebezeit et al. 2013). With the low elevation profiles of barrier islands and preference of low-lying nest sites by common eider, rising sea level and increasing storm surges may have significant effects on nest success of eiders. The intensity and frequency of storm surges in the Beaufort Sea is increasing, and sea levels have been predicted to rise by 0.26-0.98 meters by 2100 (Church et al. 2013). Model predictions suggest that wave heights and storm surges will continue to increase as ice retreats (Church et al. 2013, Lintern et al. 2013, Vermaire et al. 2013). In the future, eiders nesting on barrier islands may be impacted by both the increasing frequency and magnitude of storm surges, and an earlier timing of these events. Please include the following in this section: "Some species nesting on barrier islands, such as common eiders, could be negatively affected by predicted sea level rise and increasing storm surge. Both could flood nests and decrease productivity (see Liebezeit et al. 2013)."
- Page 3-91, Paragraph 6: Another potential impact of less sea ice is bigger, rougher sea conditions, which may impact foraging of marine birds, especially less experienced/smaller juveniles. Please update text to reflect this information.
- Page 3-91, Paragraph 6: Please provide a citation for the statement, "a delay in freeze-up in fall should be advantageous to the slow-growing young of such species as loons and swans, which are not always flight capable by time of freeze-up" or remove.
- Page 3-91, Paragraph 7: The statement, "Some species of insect-feeders (shorebirds and songbirds) can initiate nests earlier with early snowmelt, whereas others (jaegers, common eiders, and raptors) do not; however, it is unclear if birds relying on insects to feed their young (songbirds and shorebirds) could adapt to hatch at the optimum time as insect hatch continues to advance (Grabowski et al. 2013)" is incomplete for the body of climate-mediated links for some of these species. For example, as discussed in the cited reference (Grabowski et al. 2013), "The lack of response in the common eider to timing of snowmelt is consistent with other studies that have linked both nest initiation and productivity to the area of marine ice cover adjacent to the nesting grounds." Love et al. (2010) found common eiders nested earlier in warmer years associated with earlier ice-breakup and Chaulk and Mahoney (2012) found spring ice cover was a positive predictor of nest initiation date, but was also linked to smaller clutch sizes. Because climate change is predicted to lead to earlier ice-out along the coast, common eiders breeding on ARCP barrier islands may nest earlier as warming advances, but the advantage or disadvantage of this is yet unclear. For Arctic breeding geese, lower snow cover was also related to earlier egg laying (Dickey et al. 2008). Suggest changing to, "Some species, such as passerines, shorebirds, and waterfowl, initiate nests earlier with early ice-breakup and snowmelt, but the overall impact to demography is still unclear (Dickey et al. 2008, Love et al. 2010, Chaulk and Mahoney 2012, Grabowski et al. 2013)."
- Page 3-91, Paragraph 8: The statement, "Avian habitat is likely to change slowly with climate change, except for coastal areas subject to erosion and deposition (see below)" appears to be incorrect as written. Most tundra nesting birds in the ARCP prefer wetlands or moist tundra (see Bart et al. 2012). However, Arctic lakes are disappearing (Smith et al. 2005), wetlands depletion is occurring following permafrost disturbance by thermo-erosion (Perreault et al. 2017), and ponds that have been permanent water bodies for millennia, are now completely drying during the polar summer (Smol and Douglas 2007). Therefore, Arctic habitats are already impacted and this loss is predicted to expand in the future [see "Rapid climate-driven loss of breeding habitat for Arctic migratory birds" (Wauchope et al. 2016) for further discussion]. We recommend deleting this sentence or clarifying that habitat changes (e.g., higher water temperatures, less sea ice, lower

zooplankton biomass, and smaller species of zooplankton) are already occurring in the marine environment.

- Page 3-92, Paragraph 3: Please add a paragraph specific to marine habitat after this coastal habitat paragraph.
- Page 3-92, Paragraph 4: The citation (Flint et al. 2003) does not appear to support the statement, "Erosion of coastal shorelines could increase inundation of tundra by salt water; the resulting salt-killed tundra may be colonized by salt-tolerant species and develop into salt marsh, a rare but important post-breeding habitat for geese." Please correct or remove.
- Page 3-92, Paragraph 5, Line 7: If post-lease activities include transportation of oil, please address potential impacts to the marine environment. If oil transport includes any marine areas, it is not fully addressed in the draft EIS. Please update this section if oil will be transported in marine areas.
- Page 3-92, Paragraph 6: The statement, "Winter activities would affect few species and low numbers of year-round residents" is incomplete. Breeding golden eagles return to Alaska, including the Arctic Refuge, from late February to mid-April, with non-breeders arriving later (summarized in Kochert et al., 2002). Within the Arctic Refuge, most nests are initiated in mid-April (range: late March to early May) (Young et al., 1995). Some snowy owls winter on Arctic breeding grounds, but most arrive during April and May, with most egg laying occurring in mid-May (summarized in Holt et al., 2015). Based on this information, please change to, "Winter activities would affect few species and relatively low numbers of winter, spring, and year-round residents."
- Page 3-92, Paragraph 6: Potential impacts of oil development on birds are listed as four primary categories, including "injury and mortality, and attraction of predators and scavengers (including both mammals and birds) to human activity or facilities, with subsequent changes in predator abundance", but all are not discussed in the paragraphs that follow. Please consider the following to paragraph 1, page 3-93: "Changes in predator abundance and diversity could occur in all phases. For example, studies demonstrated low winter movement rates and high densities of habituated Arctic foxes in the Prudhoe Bay oil fields compared to more remote sites during winter (Pamperin, 2008; Lehner, 2012). Once uncommon, red foxes now occupy more den sites in Prudhoe Bay than arctic foxes and this shift has been linked to red foxes preference to den near facilities (Stickney et al. 2014). Injury and mortality from collisions with vehicles, structures, and wires and from contaminant exposure (including oil spills) could also occur at all phases, but would likely peak during drilling and operations."
- Page 3-92, Paragraph 7: The statement, "Exploration occurs during winter and would have little direct effect on birds" may be incomplete if cleanup activities would occur during the snow-free season in relation to exploration. Please address how cleanup operations may impact migratory birds during the snow-free season. These impacts should be acknowledged and the effects should be analyzed
- Page 3-94, Paragraph 6: The statement, "Drawdowns may cause fish mortality, and lack of fish would make such lakes unsuitable for breeding loons" is incomplete. Most birds using aquatic habitats in the program area feed on aquatic invertebrates. The sentence before states, "Withdrawing water from under ice could ... possibly result in some ... impacts on aquatic invertebrate communities"; therefore, the effects to species that feed on invertebrates should be discussed. Please change to, "Lack of fish would make such lakes unsuitable foraging habitat for some loons. Lower invertebrate abundance, or a shift in invertebrate diversity, may affect the quality of ponds as a food source for birds in general, particularly waterbirds and shorebirds."

- Page 3-94, Paragraph 6: The statement, “The long-term loss of nesting lakes would have potential population consequences for loons, primarily for Pacific and red-throated loons; yellow-billed loons in the Arctic Refuge nest primarily in the northern foothills of the Brooks Range and outside of the program area” is unclear, and may be incorrect depending on how interpreted. Yellow-billed loons are considered a rare breeder on larger lakes in the Brooks Range. Unlike other loons, red-throated loons leave breeding territories to forage during incubation and while rearing chicks. On the Arctic Coastal Plain, these birds generally forage in the marine environment (See Barr et al. 2000, Uher-Koch 2017). In addition, the limiting factors of loons breeding in the program area is unclear, therefore the statement that the loss of a few nesting lakes could have broad population consequences seems somewhat unfounded. It is also unclear if the intention of this sentence is in regards to the loss of fish from lakes or from loss of nesting habitat through drying of lakes. Please consider providing citations to support, or change to, “The loss of nesting lakes by drying could have potential local population impacts for Pacific and red-throated loons.” If the sentence is only meant to convey the effects to loons of loss of fish from breeding ponds, please also remove the reference to red-throated loons because they generally feed in the marine environment during the breeding period.
- Page 3-95, Paragraph 1: The statement, “the impact [of gravel mining] on birds would be long term and somewhat ameliorated by reclamation plans (i.e., terrestrial breeding habitats could be replaced by aquatic habitats)” is incomplete as the species groups that are likely to use gravel pits filled with water will be different from those originally displaced. Suggest changing to, “the impact on birds would be long-term. Reclamation may reduce habitat loss if pits are fully transferred back to tundra, but reclaimed tundra is of lower value to breeding shorebirds and passerines compared to unaltered habitat (Bentzen et al 2018). If pits fill with water, habitat loss may be permanent for the species originally inhabiting the site, but could provide new habitats for waterbirds (i.e., terrestrial breeding habitats could be replaced by aquatic habitats).”
- Page 3-95, Paragraph 2: The following statement may be incorrect as written: “Future construction of gravel pads and roads would result in potential long-term direct loss of habitat and indirect alteration of habitat. Direct losses from gravel coverage (up to 2,000 acres allowable) would last as long as development projects are active, or until gravel is partially removed from retired roads and pads to restore some habitat features; this is estimated to be 85 years after the first lease sale before all facilities described in the hypothetical development scenarios are abandoned and reclaimed.” Gravel pads would always lead to direct loss and potential indirect alteration of adjacent habitat. The above states habitat losses would only occur as long as the project is “active”, but this term is undefined and direct loss from gravel coverage would last until gravel is removed. Reclaimed sites in Prudhoe Bay do not provide shorebird and passerine habitat comparable to that found prior to development (Bentzen et al. 2018). Please consider changing to, “Gravel pads and roads would result in the long-term direct loss of habitat and potential indirect alteration of habitat. Direct losses from gravel coverage would last until gravel is removed. In the hypothetical development scenarios, the gravel is predicted to be removed from all facilities 85 years after the first lease sale. Shorebird and passerine habitat quality is expected to be lower for at least 10 years for reclaimed sites (Bentzen et al. 2018).”
- Page 3-95, Paragraph 5: The statement “Potential effects on waterbirds would be minimized by using the shortest road routes and smallest pads” is incomplete as written. Densities of waterbirds and shorebirds is generally greatest in wetlands on the ARCP (Bart et al. 2012). Because here we are comparing the effects of 2000 acre development scenario as described by the Tax Act, making pads smaller wouldn't minimize the effect (i.e. 2000 acres would always be affected). The statement would only be accurate if applied specifically to minimizing footprints in wetlands. Please change to,

“Potential effects to waterbirds and shorebirds would be minimized by minimizing footprints in wetlands where densities are generally highest (Bart et al. 2012).”

- Page 3-95, Paragraph 5: The statement, “Such habitats support higher densities of landbirds and impacts on these species could be greater as a result” is incomplete. Some species of waterfowl and shorebirds occur in higher densities in uplands and well-drained habitats composed of moist and shrub tundra on the ARCP (Bart et al. 2012). Lapland longspurs, the most abundant passerine breeding in the ARCP, occur at somewhat higher densities during the breeding season in wetlands on the ARCP (Bart et al. 2012). Please change to, “Such habitats are important to landbirds and some species of other guilds. Impacts to these species may be greater as a result.”
- Page 3-95, Paragraph 7: Sea duck densities in coastal areas during the non-breeding season are related to habitat features including wind and wave exposure and substrate type (Esler et al. 2000). Common eider seek foraging habitats where food was most abundant, therefore not all habitat is of equal value (Larsen and Guillemette 2000). Sea ducks also deplete preferred foods when concentrated (i.e., as occurs during molt), causing birds to seek out new foraging sites (Guillemette et al. 1996). Given this information, please provide citations to support the statement, “Although high numbers of birds use the lagoons, they are highly mobile and likely would be able to move to adjacent similar areas if necessary” or remove.
- Page 3-95, Paragraph 7: ARCP mudflats are used by a large number of post-breeding shorebirds with up to 4,000 semipalmated sandpipers documented at some deltas in late July to mid-August (Brown et al. 2012, Churchwell 2018). If barging or other nearshore activities may affect habitat availability or quality into the late summer, large numbers of shorebirds may be affected. Please address this if it is applicable for the proposed activities.
- Page 3-95, Paragraph 8: The survey (Fischer et al. 2002) was conducted along a small portion of the Alaska Arctic coast outside the program area and more applicable surveys (i.e., Lysne et al. 2004) are available that covered most of the Alaska Beaufort and Chukchi Seas, as well as the program area. Please remove, “Long-tailed ducks made up 80 percent of the birds on surveys during late summer and fall in nearshore waters of the Beaufort Sea (Fischer et al. 2002). Other species included many of those potentially breeding in the program area, plus common eiders and scoters” and replace with, “Lagoon and near-shore surveys of post-breeding and molting waterbirds were conducted across the Alaska Arctic coast during fall 2002-2003 (Lysne et al. 2004). Up to 20, 28, 29, 33, and 41% of the yellow-billed loons, red-throated loons, long-tailed ducks, scaup, and Pacific loons, respectively, counted during the entire Alaska North Slope survey occurred along the Arctic Refuge coast. Over 28,000 long-tailed ducks were counted in the lagoons and nearshore waters along the Refuge coast in some years”.
- Page 3-96, Paragraph 3: This paragraph is incomplete. It discusses a variety of winter work that may impact resident birds, but does not consider that some cleanup from wintertime travel and construction is generally necessary during the snow-free season. If any summer or fall cleanup will occur because of seismic, construction, or winter travel, this section should include a discussion of potential effects here.
- Page 3-97, Paragraph 3: Impacts to bird densities from chronic disturbances are poorly studied in Arctic Alaska. Studies outside the Arctic found bird densities increased for some species and decreased for others in relation to oil and gas infrastructure (Walker et al. 2007, Bayne et al. 2008, Dale et al. 2009, Gilbert and Chalfoun 2011, Kalyn Bogard and Davis 2014, Ludlow et al. 2015). Please provide citations to support the statement, “Potential impacts of disturbance and displacement ... are unlikely to affect ... nesting densities of breeding birds”, or remove the reference about impacts to bird densities. Please consider changing the sentence to, “Potential impacts of disturbance

and displacement by summertime construction and operations on the tundra would be long-term and may affect nesting success for some birds near facilities; however, they are unlikely to significantly affect regional or global population sizes.”

- Page 3-97, Paragraph 5: The survey (Fischer et al. 2002) was conducted along a small portion of the Alaska Arctic coast outside the program area and more applicable surveys (i.e., Lysne et al. 2004) are available that covered most of the Beaufort and Chukchi Seas in Alaska, as well as the program area. Please change the latter two sentences in this paragraph to, “Common eider are the predominant species nesting on barrier islands and using associated nearshore areas during breeding (Kendall 2005). In aerial surveys of the lagoons and nearshore areas, surf scoters were the predominant species encountered in June and early July and long-tailed ducks in late July and August (Bollinger and Platte 2012, Lysne et al. 2004, Pearce et al. 2018). Long-tailed ducks use the lagoons during their flightless feather molt (Lysne et al. 2004).”
- Page 3-98, Paragraph 3: This paragraph primarily discusses how development of the ARCP may lead to increased air traffic in Deadhorse for transport of personnel. Although increased traffic through Deadhorse seems likely, moving personnel by fixed wing aircraft may also impact other sites. Airports at Barter Island and Kavik may also experience more flights since these airports would place staff closer to the Refuge (although still not within the ARCP). In order to move these staff during the snow-free season to duty stations within the program area, some additional means of transportation would be needed. Airports and roads may need to be built within the ARCP, and/or thousands of helicopter flights might be needed, all of which may impact birds. Please consider changing this paragraph to, “All types of air traffic could disturb and displace both breeding and non-breeding birds. Air traffic would include fixed-wing aircraft into Deadhorse, Kavik, and Barter Island airports; helicopters to move people and supplies from airports to sites within the program area, and potentially fixed-wing aircraft traveling in the program area if new airports are built on the ARCP. Potential impacts on birds would be both short- and long-term.”
- Page 3-98, Paragraph 6: The statement “Vehicle and aircraft traffic and tall structures, including communication towers and drill rigs, pose collision hazards that could kill or injure birds” is incomplete. Transmission and guy wires are an equal or greater collision risk (Manville 2005). There are limited data to support the hypothesis that structure height is a significant predictor of collision risk in the treeless tundra ecosystem of the Arctic. Please change to, “Vehicle and aircraft traffic; structures, including communication towers and drill rigs; and wires pose collision hazards that could kill or injure breeding, staging, or migrating birds.”
- Page 3-99, Paragraph 2: The statement, “Collisions with tall structures increase with tower height, bright lighting, and the presence of guy wires (Manville 2005; Gehring et al. 2011)” is incomplete. Perhaps the most important results in the citations provided is that risk of tower collisions is greatest when near wetlands or in migration corridors, but this is not included in the current text. Please change to, “Collisions with structures increase with height, bright lighting, guy wires, and when structures occur near wetlands or in migratory corridors (Manville 2005; Gehring et al. 2011).”
- Page 3-99, Paragraph 3: The statement, “Collisions would be expected to occur annually in small numbers, but mortalities could be serious if flocks of birds of conservation concern are involved” does not appear to be well supported. Collisions with towers are estimated to kill millions of birds annually (see Manville 2005). Please provide citations to support that collisions are expected to occur in small numbers, or change to, “Collisions are expected to occur annually and the number of birds likely injured or killed is unknown.”
- Page 3-99, Paragraph 3: The following statement is unclear: “The potential impacts of collisions are short term, infrequent, and seasonal but would occur throughout the life of any development project

and would be restricted to roads and facilities.” The effects of collisions are often permanent and result in death. Frequency of collisions would depend on a host of factors including season, number of birds moving through an area, and weather. In some situations, dozens or more collisions occur in any given day. Collisions may also occur with aircraft anywhere in the program area. Please consider changing to, “Collisions would vary by season and occur throughout the life of any development project”.

- Page 3-99, Paragraph 6: The following statement is incorrect: “Potential salt-water spills would not be toxic to birds but would likely kill vegetation in the spill zone and thus alter habitat.” Many species of birds are not tolerant of ingestion of saltwater and others are not tolerant to its ingestion for extended periods or during certain parts of their life history. For example, despite their ecology, plovers and sandpipers lost weight when provided 0.3 M NaCl for drinking water, half the concentration of normal seawater (Purdue and Haines 1977). Even species that spend most of the lives at sea, like common eider, risk mortality if provided only saltwater during the brooding period (Devink et al. 2005). Please change to, “Potential salt-water spills would likely kill vegetation and invertebrates, and could be toxic to birds.”
- Page 3-101, Paragraph 3: The statement, “Alternative B would occur over 1 percent of the entire program area. Potential disturbance and displacement of breeding birds in tundra habitats could occur over about 2 percent of the area available for leasing” may not completely describe the potential areas impacted if large portions of the 2000-acre footprint are linear features. Please consider changing to, “Alternative B would occur over 1 percent of the entire program area. Potential disturbance and displacement of breeding birds would depend on the orientation of the footprint and amount of linear features.”
- Page 3-101, Paragraph 5: The following statement is inaccurate, “Fall staging snow geese are an important exception, as the area closed to leasing overlaps extensively with areas historically used by the largest numbers of fall staging snow geese in the program area.” There are no areas closed to leasing in Alternative C. A substantial portion of area heavily used by snow geese in the 2000s occurs in areas with standard terms and conditions (Kendall 2006). Please change to, “Fall staging snow geese are an exception, as the area of NSO overlaps with many areas used by the large numbers of fall staging snow geese that use the program area (Kendall 2006).”
- Page 3-101, Paragraph 7: The statement, “With Alternative C, potential long-term loss and alteration of habitat from direct and indirect effects of gravel deposition would be similar to Alternative B” is incomplete. An important feature of Alternative C, compared to B, is that more wetlands and moist tundra would be afforded protections through NSO along the coast and from increased buffers around those rivers most important to breeding waterbirds and shorebirds (e.g., see Brown et al 2007). Please consider changing to, “With Alternative C, potential long-term loss and alteration of the most heavily used bird habitats (wetland and moist tundra) from direct and indirect effects of gravel deposition would be somewhat less than Alternative B (the entire area is available for leasing) and would occur over approximately 1 percent of the program area; disturbance and displacement could occur over about 2 percent or more of the program area.”
- Page 3-102, Paragraph 1: Oil spills in riverine, deltaic, and lagoon habitats has the greatest likelihood of high impact to waterbirds. For this reason, Alternative D that includes the highest setbacks from waterways for refueling operations and that maximizes no surface occupancy for these habitats, will provide some protections for migratory birds. Please update the text to reflect this information.
- Page 3-102, Paragraph 2: The following statement is incomplete: “Alternative D includes some larger setbacks than Alternatives B or C for riparian areas and is, therefore, somewhat more

protective of avian habitats in riparian areas.” The larger river setbacks in Alternative D would also provide some protections for habitats adjacent to riparian areas, such as wetlands. Please consider changing to, “Alternative D includes some larger setbacks than Alternatives B or C for riparian areas and is, therefore, more protective of avian habitats in riparian areas and other important adjacent habitats such as wetlands.”

- Page 3-102, Paragraph 3: The following statement is incomplete: “however, the various NSO areas with Alternative D would be protective to many important avian habitats, including riparian and stream habitats, Canning River delta water bodies and wetlands, lagoon and barrier island habitats, and coastal habitats.” During the breeding season, shorebird, waterfowl, loon, and larid densities are highest in wetlands (Brown et al. 2007, Bart et al. 2012). Even lapland longspurs, the most abundant passerine in the ARCP, occur at somewhat higher densities in wetlands compared to drier sites (Bart et al. 2012). Within the ARCP, wetlands are generally most abundant along rivers and river buffers are largest for Alternative D. Therefore, Alternative D provides more NSO coverage of wetlands adjacent to rivers than Alternative B or C. Please change to, “however, the various NSO areas with Alternative D would be protective to the most important avian habitats, including riparian and stream habitats, Canning River delta water bodies and wetlands, lagoon and barrier island habitats, river deltas, wetlands associated with rivers and coastal habitats.”
- Page 3-102, Paragraph 3: The following statement is incomplete: “All these no lease areas, NSO areas, and CSU areas would potentially reduce impacts on birds. As with Alternative C, nearly all of the area closed to leasing are in the area of low HCP and in inland and drier habitats.” No areas are closed to leasing in Alternative C. Please change to, “All these no lease areas, NSO areas, and CSU areas would likely reduce impacts on birds. Nearly all of the area closed to leasing is in the area of low HCP and in inland and drier habitats.”
- Page 3-102, Paragraph 6: The statement, “Under Alternative D, potential long-term loss and alteration of habitat from direct and indirect effects of gravel deposition would occur over approximately 1.6 percent of the area available for leasing (1,037,200 acres). Disturbance and displacement could occur over about 3 percent of the area available for leasing” is confusing and makes it difficult to compare potential impacts for the various Alternatives. Recommend deleting this paragraph or maintaining a consistent denominator (i.e., the program area) for all alternatives. Specifically, we recommend that the comparison be the percent of the project area, not the leased area that would be affected by each alternative. Another way to present this is the total number of acres potentially altered under each alternative. Either of these would provide a more accurate comparison across alternatives than the current approach.

Wilderness

- Recommend under Oil and Gas Field Abandonment, all alternatives specify that before final abandonment, all impacted areas should be reclaimed to a point where the area is again eligible for designation as Wilderness.
- Page 3-211: The statement about Wilderness recommendation beginning with “In the Arctic Refuge CCP...” should read, “...the USFWS recommended and the President recommended the lands in the program area for wilderness designation.”
- Page 3-216: Recommend changing the first sentence of second paragraph to read “. . . naturalness, wildness, and symbolic values of an area that may be affected . . .”

- Page 3-216: Recommend changing the 3rd sentence under Alternative A to read, “Current USFWS management focuses on no or minimal manipulation of the environment, wildness, and promoting...”
- Page 3-216, 3rd full paragraph, last sentence: Recommend changing to read “. . . and, therefore, would affect an area’s . . .”
- Page 3-216, under Alternative B, line 7: Recommend changing “...would likely retain its overall wilderness character to “. . . would likely retain some of its overall wilderness character”, as the wilderness character would be lost to some degree.

Water Quality and Quantity and the Diversity of Aquatic Habitats and Species

- F-18, F.4.10: Recommend the types of impacts under drilling and operation be expanded to include reinjection of waste/hazardous waste. Impact indicators should include ground water quality.
- F-18, F.4.10: Recommend the types of impacts under barge docks and seawater treatment plant construction and operation include alterations of water temperature, salinity, and currents, as well as sediment deposition.
- F-17, F.4.10: Construction and maintenance of gravel pads, roads and air access facilities can alter wetland area and extent, and can lead to inundation and starvation of tundra. Recommend these impacts be listed under impact indicators.
- Page 3-51, 3.2.10: Tiering the impacts on water resources to BLM’s documents (NPR-A 2013, NPRA 2004a, BLM 2018) is inappropriate in many cases as impacts in the Arctic Refuge 1002 Area will be different due to the many differences between the 1002 Area and the developed areas in the NPR-A. For example, in the Arctic Refuge 1002 Area, water is relatively scarce, the terrain is steeper, and major groundwater-fed springs are extremely important. Recommend removing language related to the assumption of impacts where appropriate.
- Page 3-51, Affected Environment: Please add “topography” to controlling forces.
- Page 3-51, Affected Environment: Add “Annual total precipitation averages a little greater than 6 inches of liquid equivalent.” Source: WRCC 2018a. Historical Climate Summaries. <https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?ak0558>. This is directly from Section 3.2.1, and is relevant in this section because the precipitation in the Arctic is that of a desert.
- Page 3-51, Affected Environment: Hydrology, freeze-up and break-up are described repeatedly, but there is little discussion of summer streamflow conditions. Streamflow diminishes after break-up. Many streams and rivers become discontinuous due to limited summer precipitation and/or distribution of channels as they cross the coastal plain. Recommend the Affected Environment be expanded to include a robust discussion of summer streamflow and hydrologic conditions.
- Page 3-52, Watersheds, Rivers and Streams: The overview of freeze-up and break-up are of a general nature for north slope rivers and streams covering timing of annual flow, but lacks site specific knowledge of the coastal plain rivers and streams in which the topography, springs, and auffs are significant to the hydrology. For example, as the Hulahula River flows north from Fishhole 1, the single channel distributes into several braided channels. Often the flow within the braided channels goes subsurface or is intermittent. The data in table H-5 indicate that streamflow in several rivers diminishes significantly after break-up, but does not show that flow in several of the gaged rivers becomes intermittent (West Fork Tamayariak, West Fork Itkilyariak and Sikrelurak

would be examples). The topography of the coastal plain and morphology of rivers and streams of the coastal plain differ from that of the NPRA. River channels distribute into many channels as the flow north from the mountains or foothills. As a result, surface flow during the summer months diminishes and may be intermittent at times or in specific locations (Table H-5). Recommend including a map that highlights the hydrology of the coastal plain.

- Page 3-52, Lakes and Wetlands: Insert “due to the topography” before the statement, “lakes are very scarce...”
- Page 3-53: Insert a comma in the heading between “Groundwater” and “Springs and Aufies”. Springs (groundwater) provide significant year round habitat for aquatic resources.
- Page 3-5: Flow paths of groundwater and spring recharge within and adjacent to the coastal plain are poorly understood. We recommend the EIS consider the effects of reasonably foreseeable development activities on groundwater flow paths, evaluate the risks associated with reinjection of hazardous wastes into subsurface aquifers, and develop stipulations for leasing to avoid and minimize the potential contamination of springs. For additional information on subject see Kane et al. (2013).
- Page 3-53: Add “Tamayariak and Okerokovik” to the springs identified in this section.
- Page 3-54, Water Rights: Text incorrectly states, “...and over 360 Instream Reservations completed and pending under the USFWS. While the Instream Reservations have not been issued as a water rights permit, those applications would have seniority over any new applications received by ADNR.” Please correct and replace the portion of the text in quotation marks with the following, “...the Service has applied for 152 Instream flow Reservations within the Refuge and project area to ensure the protection of aquatic habitats and wildlife. These reservations have been pending ADNR adjudication since 1994 and have seniority over any new application for water use.”
- Page 3-55: Edit the header of the first bullet list to include “ground water quality.”
- Page 3-55: Add the following to the list of activities that will affect the hydrology and water quality: injection/reinjection of waste, drilling muds, and other contaminants.
- While Map 3-12 includes streams in which anadromous fish presence has been documented, and springs that contain resident Dolly Varden and Arctic Grayling, it needs to more clearly indicate that the Canning River supports the greatest diversity of anadromous and freshwater resident fish species in the area: it is not clear from the icons used.
- The caption for Table 3-17 suggests that this list of streams includes all fish habitat in the Program Area, yet it only identifies rivers that are classified as anadromous waters and ignores springs such as Sadlerochit Spring that supports resident Dolly Varden and Arctic Grayling. If this table is intended to be a comprehensive list of fish habitat, as the caption suggests, it should identify the rivers, springs, and lakes in the program area that support fish. The associated map (Map 3-13) does not convey much meaningful information. Please consider presenting a figure that illustrates stream monitoring locations.
- General to mapping springs, fishery resources, and water resources: Sadlerochit Springs is not a direct tributary to the Sadlerochit River. It originates west of the Sadlerochit River and is a tributary to the Itkilyariak River. Recommend correcting this information where appropriate.
- Page 3-58: Under “Changes to Surface Water Quality,” change to “...dust fallout from vehicle traffic could increase turbidity and contaminant loads in ponds...”

- Page 3-58: The reference to BLM 2012 4.5.4.2 is not relevant to the 1002 area and does not present an analysis or discussion, as it simply states that impacts are not long-term and provides no supporting data. Recommend deleting the statement or providing a more appropriate reference if the statement is retained.
- Page 3-58, Last paragraph: It should be stated that erosion and thermokarst related to development activities will have long-term impacts on surface water quality.
- Page 3-59: Under “Changes to Marine Waters” and elsewhere in the document: we question that the effects of an oil spill would be “short-term and localized,” And recommend that you remove this statement. Effects and damages from an oil spill depend entirely upon the circumstances of the spill, including material type, volume, spill response capability, weather, and sensitive resources in the area of the spill.
- Page 3-59: It cannot be assumed that water will be recharged during snowmelt because of stipulations in place. Adequate recharge depends on several factors including connectivity, watershed area and snow water equivalent. Many isolated lakes in small watersheds have very limited recharge capacity and may not be fully recharged during snowmelt after water withdrawal, especially during low snow years. For more information on “recharge vulnerable” lakes in the NPRA, see Figure 6 in Jones et al. (2017). More than 50% of the lakes presented in this study are considered recharge vulnerable. An even greater proportion of the lakes in the 1002 Area of the Arctic Refuge are likely recharge vulnerable. Recommend this information be incorporated in the document as appropriate.
- Page 3-59: Insert, “Infrastructure and operations will result in permanent changes to permafrost resulting in thermokarst and irreversible impacts to overland flow and shallow groundwater.”
- Page 3-59: In the impacts analysis section, the discussion on impacts to groundwater is limited to gravel mining impacts to subsurface flows. The potential impacts to deep groundwater flowpaths that support perennial springs are not mentioned. Deep groundwater sources and perennial springs are very important in the 1002 Area. Perennial springs have very different chemistry, thermal regimes, and ice phenology compared to other water bodies in the Refuge (See the Arctic Refuge Comprehensive Conservation Plan 2015 or papers by Alex Huryn for more information). Recommend the discussion on impacts to groundwater be expanded to include deep groundwater flowpaths and their influence on perennial springs.
- Page 3-59: In the impacts analysis section, note that contamination related to injection of hazardous wastes in subsurface areas and fracking could have major irreversible impacts to the ground and surface water quantity and quality and could impact major spring-fed systems that are important for wildlife and subsistence users. This is an important piece of information for subsistence hunters.
- General Analysis Comments for water resources and aquatic communities:
 - Be explicit about what offshore actions are planned so that these can be considered in the range of effects.
 - Total projected ice road use should be presented under development scenarios. It is expected that ice road use could increase greatly under Alternative B. Without assessments of ice road use under all alternatives, it is not possible to adequately conduct analyses of the impacts of development on vegetation, fish, other aquatic species, birds, soils, and water.
 - We recommend the feasibility of using freshwater resources (versus using groundwater or a seawater treatment plan) be more rigorously analyzed within

the different alternatives. This information is necessary to develop an appropriate analysis of the impacts of development on water resources, fish, and other aquatic species.

Air quality

- The DEIS states that the location, timing, and level of future oil and gas development on the Coastal Plain is unknown at this time and that a qualitative air analysis is being performed. In the other Alaska projects mentioned in this section, quantitative analyses have been performed using a low, medium, and high projected level of development. This type of air analysis has provided informative data to the decision makers and the public. Additionally, further project specific air analysis can tier off of the quantitative air analysis. We recommend that Appendix B., Reasonably Foreseeable Development Scenario for Oil and Gas Resources, which quantifies the most likely unconstrained projected oil and gas baseline development scenario for the Coastal Plain, be used as a basis for a quantitative air analysis and to serve as a general estimate to determine the air quality impacts due to leasing and development.

Hazardous Materials

- F-18, F.4.11 Actions affecting the resource should include injection of hazardous fluids.
- Section 3.2.1, Page 3-5, first two lines: The DEIS states, "For example, a significant fraction of CO₂ emitted by human sources each year is taken up by the biosphere, which is gaining mass in response to the emissions." Please remove this line as a significant fraction of human-sourced CO₂ is also not sequestered by the biosphere, resulting in increasing CO₂ atmospheric concentrations and increasingly obvious patterns of climate change effects, particularly in the Arctic.
- In multiple DEIS sections (e.g., Water Resources, Terrestrial Environment), description of impacts from "dust," "fugitive dust," "erosion," "scour," and "sedimentation" need to include the potential for exposure of terrestrial and aquatic biological communities, and subsistence users that rely on those, to contaminants of concern including heavy metals. Such exposure may occur through earth-disturbing activities (depending on the underlying geology) and along roadsides (from vehicle traffic).
- Thawing permafrost may also mobilize previously-sequestered contaminants, including mercury (Schuster et al. 2018, Ryder et al. 2010). Additionally, wetlands created through thawing of permafrost add to the mercury methylation potential of watersheds. Throughout the DEIS, many post-leasing activities are described as having the potential to thaw permafrost without mentioning these significant related potential effects. Please correct as appropriate throughout the document.
- Page 3-61, first bullet list: Clearly list other hazardous materials by chemical name, as has been done for methanol, propylene glycol, and ethylene glycol. Include the constituents of the industrial product types that are currently listed.
- Page 3-62, Paragraph 1: This analysis should use all of the most recent information to describe past spill frequency and volume, not just information in BLM 2014, Section 4.5.2, including all information in the National Response Center (NRC) database (at <http://nrc.uscg.mil/>).
- Oil or other hazardous spills within the Arctic National Wildlife Refuge Coastal Plain are low probability, but high consequence, events. We agree that the probability for a large oil or other hazardous material spill is low, as discussed on page 362. However, the consequences of even small (pages 3-61–3-62) spills in the otherwise pristine environment would result in significant changes from the environment as it is currently managed for non-extractive Refuge purposes. Except for

areas outside the area boundaries (e.g., DEW Line sites, Kaktovik), the Coastal Plain of the Arctic Refuge is perhaps the only Arctic region on the planet that has not experienced industrial activity and subsequent contamination, as demonstrated by baseline contaminants data (Snyder-Conn and Lubinski 1993, Vols. 2 and 3). Therefore, this EIS should discuss the consequences of an oil or hazardous material spill due to post-lease activities within the unimpacted portion of the action area, on all potentially impacted resources (water, soil and sediments, biota including microbes, invertebrates, plants, fish, and FWS trust resource birds and mammals).

- The DEIS does not clearly discuss the risk of spills in the marine shipping lanes, from Unalaska to Kaktovik, which were identified as part of the project area. Recommend expanding the discussion of spill risk to all identified parts of the project area, see Ryder et al. 2010; Schuster et al. 2018; Snyder-Conn & Lubinski 1993a & 1993b.

Vegetation and Wetlands

- Page 3-71: Long-term impacts (>20 years) of ice roads and snow trails are described, but there is not a similar discussion describing the short-term impacts. Impacts lasting even one or two years will have effects on wildlife and visitors, and perhaps more significant indirect impacts on soils, hydrology, etc. Short-term impacts need to be identified and addressed in the document as appropriate.
- Page 3-65-66: Overall this section is very difficult to follow or interpret. The headings in the discussion section do not match those in the map. For example, in the text there is a section heading “Moist Herbaceous Meadow”, and there is no corresponding heading in the map legend. It appears this may be the “Herbaceous (mesic; northern and western Alaska)” on the map but there is no discussion that allows the reader to understand how the text translates to figure 3-10. Appendix J states the information was pulled from Boggs et al. (2016). We recommend rewriting Appendix J and Section 3.3.1 pages 3-65 and 3-66 to reflect the structure in Boggs et al. (2016) and provide descriptions in Appendix J of the “Fine Scale” cover classes in the original source. See the text below as an example:

Herbaceous (mesic; Northern and Western Alaska)

Text describing this cover class.

Fine Scale cover classes

Herbaceous – Dwarf Shrub

Vegetation description and relevant information

Leymus

Vegetation description and relevant information

Herbaceous Mesic

Vegetation description and relevant information

- Page 3-67 and 3-68: Recommend using 1:63,000 map to assess wetlands instead of coarse scale analysis. At a minimum there should be definitions included in Appendix J for each wetland class. “National Wetlands Inventory Notes to the Users for North Slope 1:63,000” information sheet has definitions and a key for map codes.
- Page 3-39, Wetland Functions and Values: We recommend the section be removed or revised. The section makes one statement at the beginning relative to the affected environment in the first line of the first paragraph. The remainder of the section refers to mitigation and wetland functional

assessments that are a part of that mitigation and not the affected environment. Any statements as to the value of functional wetlands in the context of Berkowitz et al. (2017) should be reconsidered since that reference states, “This method does not identify the importance of wetlands within a watershed, measure specific wetland functions, or determine sufficiency for mitigation on its own. This methodology can be used to inform project alternatives, assess unavoidable impacts, and aid in the determination of sufficiency for mitigation.” We suggest the author rewrite this section to describe the influence wetlands currently have on the system in general or cite specific papers that evaluate Arctic wetland functions and their role in Arctic systems. This will need to be done at a very high/coarse level given there was no analysis of the finer scale National Wetland Inventory products available at the 1:63,000 mapping scale.

- Page 3-69, Paragraph 6: “Relative to wetlands in temperate regions, North Slope wetlands tend to have low function for most of the hydrologic, biogeochemical, or social functions.” Please provide a citation for this statement. Additionally, this appears to be an inappropriate comparison as functional assessments are completed at the local scale and functional values are not comparable. If one uses the hydrogeomorphic classification (Brinson, 1993), a wetland is compared against another wetland characteristic of the same class so comparison with temperate regions would also be inappropriate.
- Page 3-72, Rare and Invasive Plants: For both the impact to rare plants and the probability of introduction of invasive plants, impacts might be equal across all alternatives for the actual disturbance footprint; however, the analysis should take into account the scale of each alternative. For example, under Alternative B there may be an equal probability across the entire program area for the introduction of invasive plants and destruction of rare plants, however, under Alternative D there is an extremely low probability in the no lease sale area for the introduction or destruction of plants because there will be no disturbance in this area.
- Page 3-72, Alternative B: “...Alternative B is herbaceous (mesic) tundra, ranging from 16.4 percent in high HCP to 39.9 percent in low HCP areas...” Maximum value is 42.5 under Medium HCP TL section of Appendix J table J-3. Please correct in the Table and text as appropriate.
- Page 3-73, Alternative B, Paragraph 4: “The NSO protections preferentially preserve wetter more vulnerable vegetation common to riparian areas ...” This statement runs contrary to “Impacts affected drier, well-drained, woody shrub vegetation types to a greater degree...” from the impacts common to all alternative section above. It is not clear where the author argued that wetter sites/riparian area were “more vulnerable”. Given that riparian areas tend to be high disturbance environments, a description of those vulnerabilities should be provided. Please provide further explanation of why and, or how NSOs preferentially preserve these areas.
- Page 3-73, Alternative B, Paragraph 5: The document states, “Because of the higher incidence of low shrub vegetation ...” but fails to provide any points of comparison. Suggest rewording to “... higher incidence of low shrub vegetation in the central and eastern portion of the project area...” or something similar.
- Page 3-73, Alternative B, Paragraph 6: “The wetter types occurring in the broad freshwater emergent class are often higher functioning wetlands but were not delineated separately in the NWI mapping used in this analysis.” Because “higher functioning” is not defined, we recommend rewording as “more productive,” if that is what the author intended. Additionally, it is likely many of these habitats are delineated by using the ATTRIBUTE designation instead of the

WETLAND_TY (type) in the NWI data layer. Also see previous comment on page 3-69, paragraph 6 regarding the use of “functioning” for wetland value.

- Page 3-73, Alternative C: The source of the following statement is unclear: “...herbaceous (mesic), ranging from less than 0.1 percent to 37.4 percent of the areas open for leasing, and tussock tundra, ranging from less than 0.1 percent to 41.1 percent ...”. Appendix J table J-5 has Herbaceous (mesic) values ranging from 20.9 to 56.3 and Tussock tundra ranging from 4.7 to 44.2. Please correct if the values are inaccurate or provide a citation if values are from some other data source.
- Page 3-74, Alternative C, Paragraph 2: “The vulnerable wet tundra types in the NSO riparian areas under Alternative C are protected to a limited extent, depending on the specific design of an anchor oil field development and whether stream crossings are approved.” The document will be clearer if a specific stipulation for the statement is cited given that Alternative B states, “This restriction, however, would not preserve vulnerable vegetation or wetland types because construction would be permitted outside the TL period and would still affect vegetation and wetlands” and it does not appear that any of the stipulations in Alternative C completely prevent development.
- Page 3-74, Alternative C, Paragraph 3: “The NSO requirements for Alternative C effectively protect high-value estuarine wetlands (see discussion under *Affected Environment* and *Alternative B* above).” Contradicts Alternative B “*Impacts Common to All Action Alternatives*” would likely occur throughout the NSO/high HCP areas but to a lesser extent than in the standard terms and conditions or TL areas.” Additionally, neither of these statements address what “effectively protect” means and it is not defined in the Affected Environment section. Please clarify this statement or providing specific examples of how this protection is “effective”.
- Page 3-74, Alternative D, Paragraphs 4-6: There are multiple references to high and low-value wetlands and habitats, however, these terms or the method with which the value was determined is not stated. Please elaborate on the methods for determining value of habitats.
- The type descriptions on page J-2 are incomplete. Within each of the four types described, not all subtypes (e.g., those show on the tables) are described. The descriptions should include ecological information, for example ‘commonly occurs of low-centered polygons’, or ‘with lots of permafrost features such as frost boils’. Refer to the vegetation type descriptions in the Arctic Refuge CCP for examples.
- Tables J-1 to J-7. Please consider arranging the table a hierarchy, with land cover types divided into shrub-dominated, moist herbaceous, wet herbaceous, and other (barren, sparse and water), following the style of most vegetation classification systems, including The Alaska Vegetation Classification (Viereck et al. 1992) rather than listed in alphabetical order. For example, under wet herbaceous meadow would be listed 3 types: ‘herbaceous (wet), herbaceous (marsh), and herbaceous (wet-marsh)’. It is typical to list the most common land cover type first. Then on page J-2, under the heading ‘wet herbaceous meadow’, all 3 types would be described, with the most common one described first. Right now, that paragraph on page J-2 describes only the 2 types that cover <1% of the study area. The third type that fits in this category (herbaceous (wet)), which covers 16% of the area as mapped, is currently not described. It includes large areas of wet tundra that are not in lakes or on edges of lakes or coast. Consider describing it first, followed by the two less common types.
- The category ‘moist herbaceous meadow’ includes moist tussock sedge tundra (26% of area) and ‘herbaceous (mesic)’, (31% of area). In the description on page J-2, the first two sentences describe the herbaceous (mesic), but most readers would not recognize or be familiar with that. Given that the type covers almost a third of the study area, consideration of a more detailed description is warranted.

- Appendix F, Section F.4.12, Vegetation Information: Information in the “Impact Indicator” is not consistent with how habitat changes are quantified for other resources throughout the DEIS. The same difficulties exist for quantifying habitat changes for migratory birds (see page F-26) and caribou, but different wording is used. Please consider quantifying habitat changes similarly, and using common language, for the different resources impacted (e.g., vegetation, birds, and caribou).
- Tables starting on page F-19 repeatedly state “no indicator available to assess possible plant community changes.” When “no indicator available”, is stated in the DEIS, we recommend indicators be developed when practicable. For example, plant community composition can be quantified with field work.

Soil Resources

- The DEIS does not mention the importance of intact soil and sediment microbial communities, which form the base of the food chain. As an example, during cleanup of oil spills (especially to land) natural remediation of unrecovered petroleum products is dependent upon soil microbes. We recommend that the DEIS evaluate practices that affect soil microbes, including compaction, gravel and sand extraction, and any intentional (chlorinated domestic water) or unintentional (hazardous material) spills that affects the soil microbial biome and could diminish recovery processes.
- Recommend including “Massive Ice” map from Jorgenson et al. (2015).

Physiography

- There is no discussion about the difference in gradient and terrain between the 1002 and NPR-A and we recommend this information be included in the document. Differences in physiography are highly relevant given that the area is to be managed in a manner similar to the NPR-A yet the physiography is significantly different. Additionally, a comparative discussion between the two areas is appropriate given that there is significant comparison of water availability in Section 3.2.10.

Invasive Species

- The Service has management authority for the conservation of a variety of trust resources including migratory birds, inter-jurisdictional fish, threatened and endangered species, and their habitats. Invasive species have the potential to negatively impact these resources. Therefore, we recommend the incorporation of appropriate control and management actions be taken to avoid and minimize adverse impacts associated with invasive species and encourage the development of an invasive species control plan for all phases of the proposed project. Additional general and specific recommendations for incorporation into the EIS are provided below:
- Recommend additional information about certified weed-free gravel and supplies for road corridor construction (e.g., hay bales, wattles, blankets) and pipeline construction should be recognized throughout the document where appropriate.
- The DEIS does not adequately address the threat of aquatic invasive species (e.g., Elodea) and how the transfer of aquatic plants from other infested water bodies in the state will be prevented. Please include a description of the prevention plan and describe the planned response to an invasive species introduction.
- Additionally, we recommend the EIS state how the proponent will prevent and respond to the introduction of the following types of invasive species that may be brought in on construction supplies and equipment:

- invasive terrestrial invertebrates;
 - invasive terrestrial vertebrates (e.g., rodents); and
 - marine invasive species.
- Page 2-36, Operating Procedure: Objective - Invasive Species Prevention: Please include the list of supplies in the requirements (not just equipment and vehicles). Please add boats, planes, and helicopters to the description of what is considered a vehicle as these are all considered vectors for introduction. We also recommend adding language related to monitoring at ports for invasive species at barges, air strips, and landing pads. Additional consideration and language specific to response to invasive species other than weeds should be considered in the EIS; the paragraph in the DEIS currently only discusses "weed control measures".
- Page 3-67, Paragraphs 4 and 5, Nonnative and Invasive Plants: The statement "According to the ecological risk analysis conducted by Carlson et al. (2015), none of the documented species listed above are regarded as a significant ecological threat" is not accurate. Canada thistle and white sweetclover are ecosystem changers that stakeholders across the state are trying to prevent from spreading. The AKEPIC invasiveness rankings for those species are 76 and 81, respectively. A value of 70 or higher is recognized as a species of high concern that managers agree need action. The other species have rankings of 63 or less. This section also lacks any acknowledgement of species that are not yet in the Arctic or the Dalton Highway Corridor but could easily make it here. It is inaccurate to suggest that we are only concerned about the few species listed in the DEIS, and the concerns about species currently provided are downplayed. Please correct this information as appropriate.
- D-3: Please add the National Invasive Species Act (Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (As amended through the National Invasive Species Act (NISA))). The NISA mandates the Service to provide leadership on national efforts to prevent the spread of aquatic invasive species. The NISA furthered Aquatic Nuisance Species (ANS) activities by calling for ballast water regulations, the development of State management plans and regional panels to combat the spread of ANS, and additional ANS outreach and research. Section 1204 of the Act authorizes the ANS Task Force to provide funding to states that have an ANS management plan. The NISA established the ANS Task Force to coordinate nationwide ANS activities.
- Page D-6, Executive Orders: There is a newer Executive Order (EO) related to invasive species that should replace or be added to the current reference. Please use EO 13751.
- Action Affecting Resources, Project Construction and Operations: The section appears to be focused on terrestrial plants. Recommend this section be expanded to include aquatic plants and terrestrial invertebrates.
- Action Affecting Resources, Barging of Materials: Recommend this section be expanded to discuss possible introduction of rodents.

Visitor Use

- Section 3.4.6: Preservation of recreational hunting, fishing, hiking and boating values and opportunities is an original purpose of the Arctic Refuge and is continued under ANILCA. The majority of visitors to the Refuge recreate within the project area. Recreational access and prohibitions before, during, and after leasing and surface activity (where people can/cannot expect to be able to go, and what they expect to be able to do/not do) is not adequately addressed for Alternatives B-D, though Alternative D minimizes indirect and cumulative effects upon visitor

experiences. The EIS should further explain how recreational access before, during and after leasing will be addressed under each of the Alternatives.

Visual Resources

- Appendix A: We recommend that maps and figures be developed as part of a computer-assisted viewshed analysis using the BLM visual resource management system. Maps and figures should model foreseeable potential effects of typical layouts by showing expected changes in viewshed form, line, color, and texture of landform, vegetation, and water from: (1) suitable river corridors (including the Kongakut River, which is outside the project area, but which was found to have a scenic ORV); (2) Kaktovik; and (3) popular recreation areas. These models should identify the distances from which vertical structures could be detected. Maps modeling areas where changes to dark skies and wildlife abundance and, or distribution are foreseeable and could also be provided.

Acoustic Environment

- Within the Acoustic environment, we recommend that the effects to natural quiet and the attempts to maintain natural quiet be discussed wherever natural sounds and noise are addressed.

Fish and Aquatic Communities

The following corrections should be made to Table K-1, Appendix K-4 and K-5:

- Arctic Cisco habitat use description should delete the words "...freshwater and...", it is extremely rare to find an Arctic Cisco in freshwater at any time except during their spawning runs up the Mackenzie River. Here, it appears to read that one would be equally likely to find them in freshwater or marine environments, which is not accurate.
- Arctic Grayling spawn in the program area. While, they have rarely been encountered in the fyke net sampling programs that have been operated along the coast, all life stages are abundant in the freshwater drainages that support overwintering fish, including the Canning, Hulahula, and Sadlerochit, as well as in some lakes in the program area.
- The Arctic Grayling habitat use section should clarify that they live during all seasons in the program area. There are some streams such as the Tamayariak and Okpilak that they occupy during summer only, but those are rivers that share deltas with the Canning and Hulahula rivers, respectively.
- Burbot likely spawn in the program area. It is true that burbot have never been captured in the fyke net sampling programs that have been operated for more than seven years in the lagoon habitats of the program area and we are not aware of them being captured in the long-term fyke netting programs in Prudhoe Bay. However, they are present in the Canning River and large rivers to the west. Therefore, it is highly likely they spawn in the Canning River. They may spawn upstream from the 1002 Area boundary, but if that uncertainty is a concern, then the answer should be "probably" as to whether burbot spawn in the program area.
- Burbot habitat use description should indicate that as a freshwater fish they are present during all seasons in the Canning River, but not elsewhere in the program area. They do not migrate anywhere else for the winter as the column in the table currently reads.

- Chinook Salmon lifespan should be modified to read “4-7”, and age at maturity should be the same. They do not mature at age-1 or age-2, a small fraction may mature at age-3, but for the purposes of this general life history table, maturity at “4-7” would be appropriate.
- Chum Salmon lifespan and age at maturity should both read “3-6”. Age-4 and age-5 are the most common ages at maturity, but ages 3-6 are almost always represented as well in spawning runs.
- The Chum Salmon habitat use section should be modified by deleting the words “...and foraging...”. Similar to Chinook Salmon, Chum Salmon might forage a little in coastal marine water as they approach a spawning stream, but they would not be feeding if they were migrating upstream in freshwater.
- The Dolly Varden habitat use section reads as though Dolly Varden are common during summer and winter months in coastal and marine waters. This should be reworded to indicate that they are only found in coastal and marine waters during summer months.
- Least Cisco likely do not spawn in the program area. They occur only rarely in fyke net catches in the region and no lake bound or riverine populations have been discovered in the area.
- In the Ninespine Stickleback habitat use section, the wording suggests that they are common during summer and winter months in both marine and freshwaters, but this is not likely. The species is classified as anadromous and does venture into coastal and nearshore marine water during summer but overwinters in freshwater ponds and if available, the lower reaches of rivers. However, none of the rivers in the program area provide brackish interfaces with the sea. Ninespine Stickleback are capable of spawning in both freshwater ponds and in brackish areas.
- The Pink Salmon habitat use section should be modified by deleting the words “...and foraging...”. See related comments on Chum Salmon habitat use above.
- Round Whitefish likely spawn in the program area. Round Whitefish is a freshwater species found only in the Canning River within the program area, and both adults and juveniles are found there. We have not captured them in the coastal lagoons and bays of the area, but they do spawn in the Canning River. They may spawn in the Canning River upstream from the 1002 Area boundary, but if uncertainty is a concern, then the answer should be “probably” as to whether Round Whitefish spawn in the program area.
- The Round Whitefish habitat use section should reflect that Round Whitefish is common in the Canning River throughout the year, but not found elsewhere in the program area.

Maps

- Page 2-30: Map references aerial observations as coming from “North Slope Eider aerial survey and Arctic Coastal Plain breeding waterbird aerial survey”; however, the point location to the northeast (Beaufort Lagoon) and in the northwest (Brownlow Point) are not within the sampled area of the aerial breeding surveys. Instead, the Brownlow Point observation came from the Common Eider breeding pair survey in 2000 (referenced in Maps 3-15 through 3-20). The eastern point in Map 3-14 (Beaufort Lagoon) is misplaced and should be near Demarcation Point, which is outside of the project area. Please correct the map as appropriate. The map should also indicate that the area in white was not sampled in the aerial breeding pair surveys.
- Page 2-30: The upper panel of each of these maps should be labeled breeding survey, not post-breeding survey. The survey was timed for early incubation of common eiders. Birds observed during this survey may also include non-breeding or failed breeding birds.

Appendix D. Laws and Regulations

- Page D-3, Section D.2.2: The fourth bullet discusses the ESA. The first part of this paragraph addresses section 7(a)(2), the consultation provision of the ESA. We suggest also inserting the following language which is contained in section 7(a)(1) of the ESA: "The ESA requires federal agencies, in consultation with and with the assistance of the Secretary, to utilize their authorities in furtherance of the purposes of the ESA by carrying out programs for the conservation of endangered and threatened species."
- Page D-3, Section D.2.2: Bullet 5 addresses MMPA. We suggest adding the following to this paragraph: The USFWS may authorize the incidental take of small numbers of marine mammals of a species or stock only if it can be found that such take will have a negligible impact on a species or stock and will not have an unmitigable adverse impact on the availability of such species or stock for subsistence purposes.
- Page D-4, Section D.2.2: Bullet 2 addresses the Bald and Golden Eagle Protection Act. Please add the following language between the two existing sentences to ensure the full prohibitions of the Act are clear: "The Act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb. "Disturb" means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior."
- Page D-4, Section D.2.2: Bullet 3 addresses the Fish and Wildlife Coordination Act. We recommend replacing the existing language to clearly explain the legal authorities of the act: "The Fish and Wildlife Coordination Act provides one of the basic legal authorities for assessing the impacts on fish and wildlife resources at water resource development projects. Under the FWCA, any public or private agency under federal permit or license to modify or control for any purpose any stream or other water body is required to consult with the Service with the view to the conservation of wildlife resources by preventing loss of and damage to such resources. The term wildlife resources is explicitly defined to include birds, fishes, mammals, and all other classes of wild animals and types of aquatic and land vegetation upon which wildlife is dependent. Further, the FWCA states that reports determining the possible damage to wildlife resources and an estimation of wildlife loss "shall be made an integral part of any report prepared or submitted by any agency with the authority to authorize" water projects (16 U.S.C. 662 (b),(f))."
- Page D-4, Section D.3, Executive Orders: This list should include Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds.

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